WESTERN BLISTER RUST NEWS LETTER

BY THE

Western Office, Division of Blister Rust Control

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WESTERN BLISTER RUST

NEWS LETTER

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U. S. Department of Agriculture
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Spokane, Washington

RECONNAISSANCE IN OREGON, 1931

L. N. Goodding

Reconnaissance on white and sugar pine lands in Oregon had to be adapted to a set of conditions different from those in Idaho and California. The territory on which the white pines grow is vast, but the actual amount of timber is relatively small. To cover the entire region with the available force of men was impossible as well as undesirable. As the primary purpose was to obtain data on areas on which control work might be practicable, it was apparent at the start that many regions could be taken from the picture at once.

The sources of the information on which the work was organized were several: (1) the Forest Service records; (2) O. and C. (Oregon and California) cruises; (3) records in the office of the State Forester; (4) the reconnaissance in southern Oregon and Polk County in 1925; (5) the results of reconnaissance in the Cascades in 1926; (6) Sudworth's charts of pine distribution; (7) general information gleaned from trips taken about the state in connection with other work.

First hand information on the distribution and abundance of western white pine in the northern part of the state seemed to be adequate. It is well known that there are small stands of exceptionally fine pine, but the Still Creek lesson is not easy to forget and it seems improbable that small areas will warrant protection. There are no extensive areas north of the Cascade National Forest. Similarly, the regions in the Coast Range north of the Siskiyou National Forest have no pines likely to be considered sufficiently valuable to warrant protection. Eastern Oregon has some white bark pine, particularly in the Wallowa Mountains, but only very scattering western white pine. In southern Oregon, particular attention was paid to O. and C. and Forest Service cruises. It was found, upon observation, that land having a low cruise of sugar pine could be definitely eliminated from further consideration, for sugar pine reproduction is never found where there is not a fair stand of merchantable timber unless the original stand was logged. This premise is not warranted in studying western white pine, as an excellent stand of young pine may occur where a cruise shows nothing in merchantable timber.

Owing to the fact that the reconnaissance crew was small, land having less than 5 per cent of western white and sugar pine was given only general observation and no plot work was done, while anything over 5 per cent was studied by a strip method. The strip method was a slight modification of the one originally suggested by Putnam. The only point in which it differed was in the plots for taking pine data. These were square instead of circular, as it seemed much simpler and

far more rapid to lay out the square plots. In many cases it was deemed advisable to run strips at right angles to the contours or forest types rather than to the section lines. A 10-chain strip consisted in (1) the pine plot one chain square, and (2) a strip four chains long by one-fourth wide on which Ribes data was taken. No data were taken on the remaining five chains.

Putnam and Chapman accompanied the reconnaissance crew into the Oregon Caves region to show the men the method of laying out the strips and taking the data. After they left, the crew consisted of Fred Joy, Wheeler, Wessela, Tiedemann and Goodding. Goodding did practically none of the intensive reconnaissance but instructed the others in what territory to do their work. Thus it became his duty to be responsible for the elimination of extensive areas from critical reconnaissance.

A type map has been prepared indicating the percentages of pine through the regions covered. As stated, intensive reconnaissance was done only on the land carrying 5 per cent or more of pine. There follows a brief discussion of all these areas sufficiently large to warrant consideration. As the areas are irregular, it is difficult to consider them in any type of tabulation. Reference to any map of Oregon will show the approximate location of these areas.

18,160 acres in T. 38-39 S., R. 4-5 E., Jenny Creek area, carries sugar pine up to 8 per cent of the stand. In board measure of merchantable timber the per cent would run very much higher, probably up to 30 per cent or 40 per cent of the stand. The sugar pines are large, often scaling more than 15,000 feet to the tree. Sugar pine reproduction is scattering and poor. Other species associated are white fir, incense cedar, and yellow pine. Ribes are few. Joy thinks this area, due to the fact that the timber is over-mature, Ribes scarce, and reproduction practically nil, is in no immediate danger from blister rust, and that the timber is likely to be logged before blister rust can do damage.

26,120 acres in T. 36-37-38 S., R. 4-5 E., Big Elk Ranger Station area, occurs at high elevation at the crest of the Cascades and extends down the western slope. The entire region is quite flat. This is a poor site for pine. Growth is slow and uncertain. About 20 per cent of the stand is western white pine. <u>Ribes</u> <u>erythrocarpum</u>, <u>R.</u> <u>binominatum</u> and <u>R.</u> <u>hallii</u> are abundant. The quality and quantity of western white pine here will not warrant the cost of Ribes eradication.

880 acres in T. 36 S., R. 4 E., Mt. McLoughlin area, occur on the high slopes of Mt. McLoughlin. Here 80 per cent of the stand is white bark pine of value only as a watershed tree. <u>Ribes</u> <u>binominatum</u>

is the only Ribes, and it is very scattering along the lower edge of the area.

4,720 acres in T. 34 S., R. 3-4 E., Rustler Peak area, show sugar pine 19 per cent of the stand in the western part. The trees are large and mature. Other species are Douglas fir, yellow pine and white fir. Sugar pine reproduction is scarce. The eastern part shows about the same per cent of western white pine. This too is over-mature and reproduction is largely succumbing to white fir. Ribes are rather abundant. While this region may eventually merit control, many other areas should receive attention first.

About 270 sections in the Rogue River drainage area in T. 29, 30, 31, 32, 33 S., and R. 1, 2, 3, 4 E., constitute the finest stand of white and sugar pine in the state. In per cent of trees the area runs from 12-18 per cent, but in places it carries a much higher per cent of merchantable timber. Most of this can be considered an A-1 site for western white and sugar pine. The southern end of this area is outside the national forest, and contains the finest sugar pine in the state. The northern end has western white pine but no sugar pine. There is a gradual gradation from one condition to the other. The Ribes conditions, for the most part, are comparable to those met in the Woodruff Meadow eradication area which is near the center of the larger area under consideration. The chief species of Ribes are _R. sanguineum_, _R. lobbii_, _R. lacustre_, _R. binominatum_, _R. hallii_, _R. klamathense_, and _R. cruentum_. _Ribes bracteosum_ has been found on a couple of the tributaries of the Rogue River within this area. If any region in the state is worthy of careful consideration with a view to sanitation, this is of first importance.

About 8 sections, mostly in T. 35 S., R. 9 W., Bunker Hill Mine area, have more than 20 per cent sugar pine of good quality with excellent reproduction. The Ribes are remarkably few. While this area is more arid than the last mentioned one, it should be considered for protection because of the low cost of the operation.

There are probably no other areas in southern Oregon which are likely to be considered in the near future. A more detailed discussion with more data will be presented in the annual report.

FOOD FOR THOUGHT

G. A. Root

The November issue of the News Letter contained information and opinions which lead one to believe that the policy of control as now conducted will have to be changed. Both Guernsey and Benedict seem to have arrived at the same conclusion; that a few scattered Ribes of a particular species in strategic locations do create a serious situation. Benedict

observed that a heavy concentration of Ribes does not always mean a formidable pine infection.

Does this mean that there might be a possibility of eliminating stream type eradication in some instances and concentrating more on the upland type? If such could be possible it would save a vast amount of labor and expense. On the other hand, if it is essential that the stream type Ribes be eradicated, with a greater area in the upland type, with increased efficiency to get all of the bushes, there must need be a marked decrease in the area to be covered. To get a 100 per cent efficiency it looks as if the Johnson plan of Ribes suppression would have to be brought into play, using grass and fire as a means to the end. The intensive nature of this method precludes any widespread application but will fit into small scale operations. The planting of grasses of various kinds to restore old grazing grounds is receiving considerable attention. A recent bulletin has just been released: "Artificial Reseeding on Western Mountain Range Lands" which strengthens the nature of Johnson's plan.

There is no doubt but that to be absolutely safe, all Ribes must be removed from a given area to offer protection. It must be obvious to the well informed that these areas or units must be made smaller than heretofore. Two points seem to loom up in the conduct of the work in the future: (1) are we going to continue to cover a considerable area of ground with a certain number of Ribes or feet of live stem left which might be a menace, or (2) are we going to take smaller units and make them as Ribes-free as possible with reasonable assurance that adequate protection will be offered? This may mean the eliminating of the drainage as a unit, which if I am correctly informed, now forms the unit of work.

Perhaps a section or any number of sections could be picked out in a national forest, on state land or private holdings, and provision made for absolute protection. Make these areas "blister rust proof" and look to these for the maximum production of timber. To be sure, their selection in the first place would be made upon the excellent timber which they possess or possibly upon the excellence of the site for future production.

In the case of private holdings, which will the owner prefer - to have certain areas which he can be assured will be <u>protected</u> from rust, or larger units as are now being worked which at the best do not offer this assurance. Will the owner be more satisfied to say, "I have a number of sites, not very extensive, which are protected from blister rust", or thus - "My holdings, rather extensive, have been gone over for protection from rust, but I am not sure that such will be afforded."

Reforestation is receiving a large amount of publicity at the present time. More forestry nurseries are being established than ever before and those already in existence are being enlarged. One has only to note the expansion of this program in New York to perceive the trend

in forestry. No doubt white and sugar pine will be proportionately increased in these nurseries. Areas where these trees will be planted, will undoubtedly receive consideration from the blister rust standpoint. They must of necessity be Ribes-free, which under the best of conditions will mean considerable eradication work. The cost of propagating and planting these trees warrants their protection from an economic point of view. These planted areas will gradually become more numerous, which in themselves will be no small problem to keep Ribes-free. Will not these areas, in addition to those which at present are being covered, more than tax the resources of the blister rust program?

The writer has been mildly flayed from time to time, for propounding the doctrine of smaller units where there is a possibility of securing adequate protection. Not being a dyed-in-the-wool eradicationist, i.e. an active participant, his perspective of the situation may be slightly warped--or else he has not grasped as yet the magnitude of operations which must ensue to satisfactorily complete the program in the way it is now headed.

A PRELIMINARY TEST OF SODIUM CHLORATE AS A GERMINATING STIMULANT FOR RIBES SEEDS

D. R. Miller

It has been observed, during the past summers, that large numbers of Ribes seedlings follow on an area that has been sprayed with sodium chlorate. The number of seedlings seems to be much greater than the ordinary amount that follows other sprays and other methods of Ribes eradication. One of the possible reasons for this greater number is that the seeds are stimulated by the sodium chlorate spray. In spraying, a large amount hits the ground directly and much more drips from the bushes during and immediately following the application. This solution soaks into the duff, sometimes aided by dew and rains, but in most cases it is very much diluted by the time it reaches the base of the duff. With these facts and observations as a basis, a test was made in the laboratory using sodium chlorate ($NaClO_3$) as a Ribes germinating stimulant.

Five concentrations were used based on parts per million parts of solution. Solution 1 contained 10,000 parts of $NaClO_3$ per million parts of solution or 1.0645 per cent. Solution 2 was .1064 per cent. Solution 3 was .0106 per cent. Solution 4 was .00106 per cent. Solution 5 was .000106 per cent or one part per million, which was very weak. The reason for such wide steps in concentration was to locate the killing solution tapering down from there to one so dilute as to have no effect on germination. This would give a lead as to which concentration or concentrations were best as a stimulant. With these data, a set of samples could be run next time which would give definite results.

CULTURES IN WHICH SODIUM CHLORATE WAS TESTED AS A GERMINATION STIMULANT

Germination by Species by Medium		Germination by Concentrations of $NaClO_3$ by the Month																							
Species of Ribes at their Optimum Germ. Temp.	Germination Medium	Solution No. 2				Solution No. 3				Solution No. 4				Solution No. 5				Water				Totals			
		1st Mo.	2nd Mo.	3rd Mo.	Total	1st Mo.	2nd Mo.	3rd Mo.	Total	1st Mo.	2nd Mo.	3rd Mo.	Total	1st Mo.	2nd Mo.	3rd Mo.	Total	1st Mo.	2nd Mo.	3rd Mo.	Total	1st Mo.	2nd Mo.	3rd Mo.	Total
<u>R. lacustre</u> Run at 25° - 5°C.	Alkaline	1	5	1	7	22	8	2	32	16	14	2	32	11	17	1	29	18	22	-	40	68	66	6	140
	Neutral	1	2	2	5	5	25	6	36	-	13	12	25	6	19	3	28	5	27	7	39	17	86	30	133
	Acid	-	1	1	2	6	25	2	33	-	5	13	18	-	17	6	23	-	-	-	-	6	48	22	76
	Total	2	8	4	14	33	58	10	101	16	32	27	75	17	53	10	80	23	49	7	79	91	200	58	339
<u>R. petiolare</u> Run at 25° - 10°C.	Alkaline	5	2	-	7	21	3	-	24	27	2	-	29	23	2	1	26	13	3	2	18	89	12	3	104
	Neutral	7	4	-	11	28	2	-	30	43	-	-	43	28	-	-	28	29	3	2	34	135	9	2	146
	Acid	3	1	-	4	29	1	-	30	35	2	1	38	36	1	-	37	8	6	3	17	111	11	4	126
	Total	15	7	-	22	78	6	-	84	104	4	1	110	87	3	1	91	50	12	7	69	335	32	9	376
Totals	Alkaline	6	7	1	14	43	11	2	56	43	16	2	61	34	19	2	55	31	25	2	58	157	78	9	244
	Neutral	8	6	2	16	33	27	6	66	43	13	12	68	34	19	3	56	34	30	9	73	152	95	32	279
	Acid	3	2	1	6	35	26	2	63	35	7	14	56	36	18	6	60	8	6	3	17	117	59	26	202
	Total	17	15	4	36	111	64	10	185	121	36	28	125	104	56	11	171	73	61	14	148	426	232	67	725

Note: Solution No. 1 failed to germinate.

Two species of Ribes seeds were used, R. lacustre and R. petiolare. The former was run at 25°C day and 5°C night, and the latter at 25°C day and 10° C night - their optimum temperature combinations. Each species was run on alkaline, neutral, and acid peat mediums. A control set was run using water for moisture content. Fifty seeds, which had been sterilized in Uspulun, were planted in each dish.

An analysis of the table or results gives the following indications: (1) that solution 1 was too concentrated to permit germination of either species; (2) that R. lacustre was stimulated on acid peat but not on the other two mediums; (3) that germination of R. lacustre started the first month but reached its peak during the second month; (4), that for total germination of R. lacustre for the three mediums, the peak was reached in solution 3, while solutions 4 and 5 were about the same as the control set; (5) that R. petiolare was decidedly stimulated by solution 4; (6) that for R. petiolare germination was also stimulated by solutions 3 and 5 in the alkaline and acid mediums; (7) that practically all the seeds of R. petiolare germinated during the first month of incubation, and (8) that future work should be concentrated around solutions 3 and 4.

It was observed that as soon as germination occurred in solution 2, the tip of the radicle was already brown and in no case did the seedling live; thus indicating that the solution was too strong for seedling survival.

At the termination of the germination study, the peat from the dishes was tested for $NaClO_3$, not as to amount but as to presence or absence. No trace was found in solutions 4 and 5, but the method used might not have been sensitive enough for such dilute solutions. Solution 1 gave a heavy test while solutions 2 and 3 showed only traces of $NaClO_3$.

FURTHER VIEWPOINTS ON EFFECTIVENESS OF CONTROL

W. G. Guernsey

It was with a mixture of sincere concern and no little dismay that I read H. N. Putnam's reaction to my article written after my trip through the Northeastern States. I greatly appreciate, however, Putnam's effort in bringing to light various dark spots of my first article. I feel it my duty nevertheless to clarify some of my unfortunate mental reactions in order to clear my Eastern hosts of any complicity in the matter.

I am still quite sure that the major points to which Mr. Putnam objected are of extreme importance to the Western viewpoint. I am certain that the Western view to date has been altogether too optimistic in regard to control measures needed to check future depredations of the rust in our Western white pine stands. It is high

time that we realized the deadly results that are on their way should our plans be inadequate for control of the rust.

I am also of the belief that Putnam's mind was seeing visions far in the future when passing through the Eastern pine stands. He was looking forward to young stands springing up entirely free from infection and growing rapidly to maturity. But I must again bring forth the fact that infection on white pine is distributed over the entire East and not just in small areas as Putnam intimates. It is quite true that pine coming in during the last ten years is practically free from infection and typifies excellent protection from rust over the entire white pine region of the East. But I again must bring Putnam's mind back to the Western forests and, as blister rust is well established through these forests, appeal to his imaginative mind to confirm the fact that our loss in this present white pine rotation will be staggering. Is there any reason why, as persons interested in forestry, tree growth, etc., we should not feel gloomy and somewhat pessimistic with this picture in mind? It is also true that we look ahead and immediately brighten up with the prospect of future stands unclaimed by blister rust damage. But enough is enough and I shall leave Mr. Putnam and go on to other things.

Our Western conference or personnel meeting is approaching and we have many important things to think of. It is a thought that too many of us have been thinking of miracles unsupported by facts, (reference made to articles in May and December Journals of Forestry). Isn't it a fact that many important phases of blister rust study have been passed over after being established by blister rust action in the East which is confirmed in the West? It has been thought that the action of the rust was entirely different in the East from what it is in the West. It seems that in a general way the action is practically one and the same. It would seem very feasible for some person well versed in blister rust study to put down in black and white all the facts established to assist in blister rust control. Are the various studies and practical control measures linked together with an ultimate aim at control of the rust? There are many such questions that should be asked at the conference in order to clear up any mirage that may appear before our minds.

We are quite sure that Ribes must all be pulled, either on first eradication or on a second or third. This is a basic fact and the people employed on practical eradication of Ribes must have the assistance of the work and study carried on by the other projects or parts of the division, if success is to be attained.

How would it be for the personnel of the various projects, or parts of the division, to ask each other questions through the News Letter? The results would be in such a form as to be beneficial to all the members of the office and could be explained in detail by the various interested projects.

BLISTER RUST MEN TAKING GRADUATE WORK AT IDAHO

E. E. Hubert

Two former employees of the Division of Blister Rust Control are taking graduate work at the School of Forestry, University of Idaho, with the object of obtaining the master's degree and Douglas R. Miller, who has been assigned to the Idaho laboratory since 1928, is completing his thesis requirements this year.

Royale K. Pierson is working on the function of pycnium of the white pine blister rust. Pierson has already made several interesting discoveries regarding the pycnial stage of the rust and has planned a detailed histological study of the fungus as it occurs in the bark tissues. This study will be supplemented by cross fertilization and cultural studies. Pierson is a graduate of the University of Montana and has been with the Spokane office for several summer seasons. Pierson plans to return to Idaho next year to complete his thesis and receive his degree.

David J. Stouffer, formerly blister rust state leader in Michigan, where he spent several years on federal blister rust work, is studying the cultural means of developing in the laboratory certain fungous parasites which attack the white pine blister rust. The principal objective will be the rapid production of large quantities of spores for use in inoculation experiments in the greenhouse and in the field. Stouffer is now working with the European and the British Columbia strains of _Tuberculina maxima_. He expects to receive his degree in 1932.

Douglas R. Miller of the Spokane office is preparing his thesis on the germination of Ribes seeds, the laboratory work on which has been completed. Miller, who plans to receive his master's degree in 1932, is now working on the problem of germinating Ribes seeds collected in duff samples secured in northern Idaho this past summer.

BUY CATERPILLARS

Chas. H. Johnson

Some time ago our editor asked when he could expect that article. Answer - possibly next month. Nothing further was said but it is assumed that he had reference to caterpillars. Since August, numerous attempts have been made to prepare an article on bulldozing operations in our stream type. Many pages dealing with costs, advantages, and possibilities were written and either filed or cast into the waste basket because after the ink had become thoroughly dried, a feeling always prevailed that possibly too much was claimed and sufficient work had not been accomplished to substantiate all that was written. The writer is not convinced of any waste of time, ink, pencil or paper. Time and thought devoted to Ribes eradication is not wasted. Whether we direct our thoughts to Ribes eradication in the stream type or on the slopes--it matters not--

there are practical solutions to our problems. No one in our organization wants to admit that the most active days of his working career were devoted to a proposition which was left unsolved.

Returning to the act of bulldozing, we know from three days' experience that satisfactory results were accomplished. In one operation heavy brush and windfall have been removed and the soil prepared for seeding; Ribes inerme concentrations were plowed out and rendered safe for burning. The time and cost involved compared favorably with other methods of eradication.

The possibilities regarding the operation of bulldozing are as yet unknown but the field is rife for speculation. Every man supervising an eradication job may have fixed ideas as to where a bulldozer will or will not work successfully. The line should not be drawn too close. A demonstration is bound to convince the most skeptical that the machine is not easily stopped. If a bulldozer is discovered operating in the vicinity of an eradication job ask the operator for a brief demonstration. The first thought should be how many men and horses would be required to compete with the caterpillar.

The reactions to land clearing through the use of machinery and establishment of a turf have been most favorable. A Forest Service official promised the aid of a large number of ranchers in removing the Ribes from approximately 800 acres of a 1931 stream type burn, provided sufficient grass seed was made available. Another important official and cooperator exclaimed, "Why! You are performing three things in one operation. If a bulldozer will do what you say, you are getting somewhere fast and may depend on us." Let's not get into a rut and bank too heavily on one method. It is essential that we lose no time in getting out Ribes. The answer to some of our difficulties is utilization; so when pulling, sweating and squirting Ribes let us at least think about utilization and its derivatives. In the meantime place your stakes on caterpillars.

RODENTS AND CONIFEROUS SEEDS

Frank A. Patty

Late last fall the pine squirrels or chickarees, as they are more often called, were busily engaged in gathering a supply of coniferous seeds for winter use. The chickaree climbs the sugar pine, cuts off from four to seven cones, returns to the ground and removes the seed by cutting off the cone scales. It is not advisable to hold a noonday luncheon under a sugar pine when the squirrels are dropping the cones to the ground because a cone from 10 to 18 inches long, weighing several pounds, gains considerable momentum in a hundred foot fall. A few of the seeds are eaten at the time of removal from the cone but most of them are stored away in the nests while a few seeds are placed in holes dug in the soil and duff to be recovered when needed. Due to the absent-mindedness of the squirrel or to his sudden death at the hands of his natural enemies, some of the buried seeds are left in the ground to germinate the following spring. The

presence of a dozen or more sugar pine seedlings in a clump indicates a forgotten cache. In spite of the activity of the chickaree, many cones remain on the tree to ripen and to disseminate their seeds in a normal way.

The ground squirrels, chipmunks and field mice also take a lion's share of the coniferous seed. None of these rodents have been observed cutting the cones off the trees but they do pick up seed from the ground which has fallen from the tree or is left by the chickarees. The large ground squirrel will gnaw on a cone but he apparently does not know how to remove the scales. Chipmunks and field mice have never been observed working on the cones. However, they will collect pine seeds whenever possible.

When one realizes the number of rodents on a given area, an understanding may be had why restocking by sugar pine takes such a long time.

Perhaps if the trapping season on some of the natural enemies of rodents were closed for a few years, a better balance of nature would be obtained. Hawks, martins, weasels, mink, fishers, wolverines, coyotes and badgers are all predators on rodents.

MORE ABOUT THAT EASTERN TRIP OF GUERNSEY'S

G. A. Root

Evidently Guernsey's article has created a trend of thought from various angles as shown by Putnam's article, "Viewpoints on the Effectiveness of Control in the East" in the December issue of the News Letter.

I rather suspect Guernsey's ideas were genuine but were indirectly due to the environment in which he has been working. He has been able to ride for miles in the West without perceiving evidence of the rust, though it must be conceded that more infections are present than can be seen. The vast expanse of country, let us say in northern Idaho, cut by few roads and comparatively few trails has not afforded the cross section of the country that New England has, with its numerous highways and ease of approach to practically all sections. Furthermore, the rust has been in New England a much longer time.

Guernsey should not be unduly alarmed on seeing considerable disease, for in spite of control measures there is going to be a lot of rust in spots. He either saw a great deal more rust than Putnam is led to believe or else he (Guernsey) failed to note the non-infected areas as he went from one pine infection area to another. It is hardly possible that he saw rust along the entire route for if he did he <u>would</u> have grounds for some pessimism.

The blame for part of Bill's reaction, I think, can be laid at the door of the Eastern workers, as Putnam says. They apparently showed him the worst infected areas without calling his attention to

those areas, possibly with one exception, clean or practically so, due to control measures. There should be a considerable number of these.

To be fair to the Western man who has not seen Eastern conditions and to themselves, the Eastern workers should show a cross section of conditions and their program of work and then let judgment be with the man. He may or may not have the utter optimistic view which some would like.

It is a bit gratifying to a New Englander that the idea of showing only the large, rosy layers of apples on the top of a barrel, in anticipating a sale, has seemingly changed. But apparently it has gone to the other extreme where only the culls are shown. We hope a happy medium will be struck where both the rosy apples and the culls will be brought to light and unbiased judgment then pronounced.

Could it be possible that the course pursued by our Eastern co-workers was due in part to that prevailing Western idea of optimism bred by the wide open spaces? Did they think, "Well, here comes a 'bird' from the West; he'll give us a clean bill of sale no matter what we show him"? Once in a while the "bird" doesn't run true to form. To ease the situation, I believe the Eastern men did what they thought was best in the time allotted for such a trip as is ordinarily taken by an observer.

The subject of that house-selling proposition cannot go unchallenged. It is apparent that our good New England friend from Vermont has acquired that Western acumen of salesmanship. But show me the wonderful house in the $4,000 class without a fireplace (I reside in California) that is old and needs repainting! Put in a fireplace, renew a few of those old joists and studdings, paint the house, (two coats) and I'll buy it for $3,500.

MAYBE HE WAS A SAILOR? (Continued)

Anonymous the 2nd

Why not go on with the story and tell how the little colt on meeting his parent after that memorable trip, said: "How cometh the imprint of that boot upon thy rump?" - "Oh! That? I was just starting to play 'patty cake' with a two legged Government critter up the road when he becameth a bit rough."

ANOTHER HAS FALLEN

The rapidly thinning bachelor ranks of the Western Blister Rust organization was depleted by one on December 23 when George E. Draper and Miss Ruby Bauer of Jerome, Idaho, were married at Clarkston, Wash. Following the ceremony the newlyweds spent a short honeymoon at Lava

Hot Springs and at Jerome, Idaho, visiting the bride's parents.

Miss Bauer was a member of the 1930 graduating class at the University of Idaho. Mr. Draper was awarded a B. S. degree in chemistry by the University of Arizona in 1927. He is now working on chemical experimental work on both Ribes and barberry eradication.

THE CONIFEROUS SEED CROP FOR 1931

Frank A. Patty

The sugar pines in the vicinity of Strawberry, California, on the Stanislaus National Forest produced a very heavy crop of seeds in 1931. Jeffrey pine and incense cedar had rather light crops, while yellow pine and white fir were almost devoid of cones. In contrast to the heavy crop of sugar pine cones on the Strawberry area, only a very light crop was noticed near Mineral on the Lassen National Forest and near Quincy on the Plumas National Forest.

If a favorable spring for germination and subsequent favorable years for survival of the sugar pine seedlings are to be had during the next three years, sugar pine reproduction should be very much in evidence in the Stanislaus National Forest, especially on the recent cut-over areas.

The excellent stands of sugar pine now found in California are probably the result of a combination of good seed years and seasons favorable to germination and survival. The infrequent occurrence of these conditions in their proper sequence may account for the uneven aged stands of sugar pine in its natural range.

NOTES

S. N. Wyckoff and C. C. Strong attended the Region 1 Investigative Council Meeting at Missoula, Montana, January 4 and 5. They spent January 6 in Missoula talking over plans for 1932 blister rust work.

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A talk on blister rust was given by the editor before the biology class at Whitworth College on Friday, January 15.

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Messrs. Joy and Putnam made a trip to Moscow, Idaho, January 13 for a conference with Dr. Hubert and Messrs. Reed Miller, d'Urbal, Pierson and Stouffer who are working on blister rust studies. They report that they learned more about the microscopic characteristics and actual methods of rust infection and development than they ever knew before.

* * *

S. N. Wyckoff and W. V. Benedict left January 16 for San Francisco, California to attend the Region 5 Investigative Committee Meeting January 18, 19 and 20.

Vol. 7 No. 2

February, 1932

WESTERN BLISTER RUST

NEWS LETTER

* * *
Confidential
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INDEX

U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

THE 1932 ANNUAL CONFERENCE

The need for more intensive Ribes ecology and Ribes eradication methods studies were two of the many important things brought out during the 1932 annual conference of Western Blister Rust employees held February 8 to 13 in the Spokane Office.

Doctor Waters, of the University of Montana, in speaking on the subject "What More Can Ribes Ecology Offer of Concrete Value to Local Control?" cited a number of questions having an important bearing on local control which Ribes ecology studies can answer:

"In order to plan chemical Ribes eradication work properly, we need to know something of the relationship between the root system and the aerial portions of stream type Ribes", Dr. Waters said. "Also we must know how Ribes seeds are scattered, how far they are carried from the parent plant, and how long the seeds may remain in the duff in a viable condition. Ribes ecology can answer these and many other questions. It is important that these studies be inaugurated as soon as possible."

Much time was devoted to discussion of chemical investigative work during the meeting. G. R. Van Atta pointed out that while further discoveries are possible in the way of new toxic chemicals, the most hope lies in the direction of improved methods of application of our present chemicals. "We have chemicals which will kill R. petiolare under most conditions", Van Atta said. "What we must do now is to devise a means of applying the chemical under the adverse conditions so that a kill may be secured. We are still working on a chemical to use on R. inerme and when that is found the problem of disposing of a number of other resistant species will probably be solved". Soil treatments was one method of chemical application mentioned which holds possibilities of solving the R. inerme problem.

C. H. Johnson's method of permanent suppression of Ribes by the use of bulldozing, fire and grass was given careful thought. While not enough work has been done to thoroughly prove the method, present indications are that in certain locations it will be entirely feasible. Additional work along this line is planned for the coming field season.

"We can never hope to entirely eradicate blister rust from the western white pine region", said Professor Barss of Oregon State College in his talk "What Do We Mean by Control?" "What we can expect is to so gain the governing power of the disease as to hold it down to the status of a minor pest and continue to grow white pine at a profit". Professor Barss pointed out that we have no way of actually determining whether or not we are getting control until the trees we are attempting to protect give us the answer.

What a very few feet of Ribes live stem can do in spreading blister rust was demonstrated by J. L. Mielke of the Division of Forest Pathology. He reported on study plots at Revelstoke and Hunter's Siding,

British Columbia, where from 18 to 27 feet of R. lacustre and R. viscosissimum at the center of 1.6 acres circular plots caused intensive spread of the disease to pines on the plots. The Ribes were inoculated 100 per cent by hand methods in these experiments.

Our control work was discussed in the light of Mielke's plot data. The consensus of opinion was that working to a limit of 50 feet of live stem per acre is not sufficient and that we must take out as near to 100 per cent of the Ribes live stem as possible.

The fact that only 16 per cent of a crewman's time is actually spent in pulling Ribes in hand eradication was brought out by M. C. Riley in discussing the problem "What Further Improvements Are Possible in Ribes Eradication Methods?" To eliminate much of the searching time is one of the problems confronting the methods and eradication projects. Increasing the pace of the crews, use of smaller crews and leaving hidden bushes for mop-up crews were some of the methods suggested to solve this problem. The question of a satisfactory eradication tool was discussed at length. The main objection to the use of tools in hand eradication voiced by the eradication men was that parts of crowns were often left to produce sprouts and that in working with Ribes which have compound crowns only the nearest crown is removed.

Riley suggested that a preeradication survey crew be used to cover all areas on which we may be required to do control work in the near future. Also to attempt to use reconnaissance data, on all except stream type, in place of making a preliminary eradication survey. Opinion was divided on this question and no definite decision was reached. Several of the eradication men objected to the use of one crew for all preliminary survey work on the grounds that it greatly helped the camp boss who has to work the area to do the preliminary survey work. Aerial mosaic maps were mentioned as a means of securing valuable data not procurable by other means. This matter was left for more thorough investigation.

Ed. Joy, in outlining the spread of the rust in the West since its introduction in 1910, pointed out that we now have the disease well established over the Inland Empire white pine belt. That the intensification throughout the region will be exceedingly rapid was demonstrated by an analysis of known infection areas where studies have been conducted. These data show that for each canker of the original infection about 1,700 cankers are produced in the next cycle. This figure is an average taken over all infections in the Inland Empire which ranged from a ratio of 1:2 to 1:3000.

An analysis of our working plans in light of our technical findings by H. N. Putnam showed that in our control work we are following exactly the dictates of our technical knowledge as far as the nature of the work will permit.

An entirely new method of presenting the material to the conference was adopted this year. Instead of attacking the work by projects

as formerly the entire situation was presented on a discussion basis. The first session was devoted to a summarization of all work done from 1922 to 1931 in order to lay the groundwork and furnish facts for the discussion of our future work. Each particular line of work was assigned to a discussion leader who started the fireworks on that particular subject. In former years it has been necessary for the chairman to plead for discussion. This year he was forced to battle to keep the floor clear for one speaker at a time. At the opening session Ed. Joy presented Chairman Wyckoff with a gavel made from a root of R. watsonianum from Mount Rainier, Washington. Mr. Wyckoff used this weapon to good advantage in quieting the unruly multitude at times.

The generally voiced opinion at the close of the conference was that it was the best and most constructive conference we have ever had.

A resolution was passed authorizing the chairman to express to S. B. Detwiler, G. B. Posey and H. R. Offord the regrets of the Western personnel at the inability of those men to attend the conference.

PRESENT IN THOUGHT

Immediately before the opening of the 1932 annual personnel conference, the following telegram was read. The language indicates that Harold is about back in regular form.

> "Regards to assembled multitude especially those who wear no hobnail boots and best wishes for merry massacre stop Regret important experiment prevents me from enjoying Wyckoff wariness Putnams prestidigitations and Gooddings gallicisms stop Hereby extend Van Atta my vote by proxy to help California contingent. Offord"

PRESENT STATUS OF BLISTER RUST IN THE INLAND EMPIRE AS DETERMINED FROM SCOUTING

E. L. Joy

Previous to 1931 blister rust on either Ribes or pines was found distributed over the entire white pine region of the Inland Empire. Sixteen pine infection centers were found, 15 of which are located in the southern part of this region in an area which is almost coincidental with the area in which grows Ribes petiolare. The exception is the center at Newman Lake, Washington.

In 1931 45 new centers were found, making a total of 61 centers. As previously discovered all except the Newman Lake center are located

within the R. petiolare belt. The following tabulation gives pertinent information about these known centers:

TABLE NO. 1

KNOWN PINE INFECTION CENTERS IN THE INLAND EMPIRE

St. Joe National Forest

Location	Year Found	No. Pines Examined	No. Pines Infected	No. Cankers	Probable Year of Origin	Associated Ribes
Railroad Creek, T. 47 N., R. 5 E., Sec. 28	1931	200	2	2	1927	R. petiolare R. viscosissimum R. lacustre
Champion Creek, T. 47 N., R. 5 E., Sec. 27	1931	200	3	5	1927	R. petiolare R. viscosissimum R. lacustre
No Name Creek, T. 47 N., R. 5 E., Sec. 34	1931	500	1	1	1928	R. petiolare R. viscosissimum R. lacustre
Lucky Swede Creek, T. 46 N., R. 6 E., Sec. 6	1931	150	2	2	1927	R. petiolare R. viscosissimum R. lacustre R. irriguum
Little North Fork St. Joe, T. 46 N., R. 6 E., Sec. 6	1931	350	3	3	1927	R. petiolare R. viscosissimum R. lacustre R. irriguum
Ward Creek, T. 46 N., R. 7 E., Sec. 20	1931	100	1	1	1927	R. petiolare R. viscosissimum R. lacustre
Kelley Creek, T. 46 N., R. 7 E., Sec. 7	1931	150	1	1	1927	R. petiolare R. viscosissimum R. lacustre
Turkey Creek, T. 46 N., R. 7 E., Sec. 18	1931	100	1	1	1927	R. petiolare R. viscosissimum R. lacustre
Cliff Creek, T. 47 N., R. 6 E., Sec. 35	1931	300	6	9	1927	R. petiolare R. viscosissimum R. lacustre
Loop Creek, T. 46 N., R. 6 E., Sec. 4	1931	100	1	1	1927	R. petiolare R. inerme R. viscosissimum R. lacustre
Loop Creek, T. 46 N., R. 6 E., Sec. 12	1931	200	1	1	1927	R. petiolare R. inerme R. viscosissimum R. lacustre

TABLE NO. 1 (continued)

KNOWN PINE INFECTION CENTERS IN THE INLAND EMPIRE

St. Joe National Forest (continued)

Location	Year Found	No. Pines Examined	No. Pines Infected	No. Cankers	Probable Year of Origin	Associated Ribes
Loop Creek, T. 46 N., R. 7 E., Sec. 18	1931	100	1	1	1927	R. petiolare R. inerme R. viscosissimum R. lacustre
St. Joe River, T. 45 N., R. 6 E., Sec. 22	1931	200	2	2	1927	R. irriguum R. viscosissimum R. lacustre
St. Joe River, T. 45 N., R. 6 E., Sec. 23	1931	100	1	4	1927	R. viscosissimum R. irriguum R. lacustre
Bird Creek, T. 45 N., R. 6 E., Sec. 13	1931	50	1	1	1927	R. petiolare R. viscosissimum R. irriguum R. lacustre
Kyle Creek, T. 46 N., R. 5 E., Sec. 13	1931	200	1	1	1927	R. petiolare R. viscosissimum R. lacustre
Hammond Creek, T. 46 N., R. 5 E., Sec. 25	1930 1931	300	2	2	1927	R. petiolare R. viscosissimum R. lacustre
Fishhook Creek, T. 45 N., R. 5 E., Sec. 17	1931	100	4	4	1927	R. viscosissimum R. lacustre
Fishhook Creek, T. 45 N., R. 5 E., Sec. 17	1931	100	2	2	1927	R. viscosissimum R. lacustre
Fishhook Creek, T. 44 N., R. 5 E., Sec. 20	1931	100	1	1	1927	R. viscosissimum R. lacustre
Fishhook Creek, T. 44 N., R. 5 E., Sec. 4,5,8 and 9	1931	3,000 (Est.)	1,500 (Est.)	150,000 (Est.)	1923	R. petiolare R. viscosissimum R. irriguum R. lacustre
Slate Creek, T. 47 N., R. 4 E., Sec. 36	1931	200	1	1	1927	R. petiolare R. inerme R. irriguum R. viscosissimum R. lacustre
Slate Creek, T. 46 N., R. 4 E., Sec. 14	1931	900	4	4	1927	R. petiolare R. inerme R. irriguum R. viscosissimum R. lacustre

TABLE NO. 1 (continued)

KNOWN PINE INFECTION CENTERS IN THE INLAND EMPIRE

St. Joe National Forest (continued)

Location	Year Found	No. Pines Examined	No. Pines Infected	No. Cankers	Probable Year of Origin	Associated Ribes
Slate Creek, T. 46 N., R. 4 E., Sec. 27	1931	400	2	2	1927	R. petiolare R. inerme R. irriguum R. viscosissimum R. lacustre
St. Joe River, T. 45 N., R. 3 E., Sec. 6	1931	400	3	3	1927	R. viscosissimum R. lacustre
Coeur d'Alene National Forest						
South Fork, Coeur d'Alene River, T. 48 N., R. 6 E., Sec. 35	1931	600	1	1	1927	R. petiolare R. viscosissimum R. lacustre
Brown Creek, T. 50 N., R. 3 E., Sec. 14	1931	800	2	2	1926	R. viscosissimum R. lacustre
Coeur d'Alene Timber Protective Association						
Pine Creek, T. 47 N., R. 1 E., Sec. 13	1931	1,500	1	1	1927	R. irriguum R. viscosissimum R. lacustre
Mica Creek, T. 44 N., R. 2 E., Sec. 4,5,7,8 and 17	1931	800	50 (Est.)	100 (Est.)	1927	R. petiolare R. viscosissimum R. lacustre
Marble Creek, T. 44 N., R. 2 E., Sec. 34	1931	400	4	7	1926	R. petiolare R. viscosissimum R. lacustre
Marble Creek, T. 44 N., R. 2 E., Sec. 35	1931	400	4	4	1927	R. petiolare R. viscosissimum R. lacustre
St. Maries River, T. 42 N., R. 2 E., Sec. 5, 8 and 11	1929 1930	403	46	21,000 (Est.)	1923	R. petiolare R. inerme R. viscosissimum R. lacustre
Merry Creek, T. 43 N., R. 2 E., Sec. 33	1930	1,000	100	700 (Est.)	1927	R. petiolare R. triste R. inerme R. viscosissimum R. lacustre
Potlatch Timber Protective Association						
Elk Creek, T. 40 N., R. 2 E., Sec. 14	1931	50	2	2	1927	R. petiolare R. inerme R. viscosissimum R. lacustre
Robs Creek, T. 41 N., R. 1 E., Sec. 22	1931	20	1	1	1927	R. petiolare R. inerme R. viscosissimum R. lacustre

TABLE NO. 1 (continued)

KNOWN PINE INFECTION CENTERS IN THE INLAND EMPIRE

Potlatch Timber Protective Association (continued)

Location	Year Found	No. Pines Examined	No. Pines Infected	No. Cankers	Probable Year of Origin	Associated Ribes
East Fork Potlatch Creek, T.41 N., R. 1 E., Sec. 36	1931	300	3	3	1923	R.petiolare R.inerme R.viscosissimum R.lacustre
Ruby Creek, T. 40 N., R. 1 E., Sec. 15, 18; T. 40 N., R. 1 W., Sec. 13	1931	827	454	8,457	1923	R.petiolare R.inerme R.viscosissimum R.lacustre
Bull Run Creek, T. 39 N., R. 2 E., Sec. 10	1931	100	2	3	1927	R.petiolare R.viscosissimum R.lacustre
Deep Creek, T. 39 N., R. 3 E., Sec. 6	1931	7,129	550	989	1923	R.petiolare R.viscosissimum R.lacustre
Cameron Creek, T. 40 N., R. 2 E., Sec. 33	1931	25	20	250	1927	R.petiolare R.lacustre
Cameron Creek, T. 40 N., R. 2 E., Sec. 31	1930	75	5	5	1927	R.petiolare R.lacustre
Cameron Creek, T. 40 N., R. 1 E., Sec. 25	1930	20	4	8	1927	R.petiolare R.lacustre
Johnson Creek, T. 40 N., R. 2 E., Sec. 19	1930	250	9	16	1927	R.petiolare R.inerme R.viscosissimum R.lacustre
Shattuck Creek, T. 40 N., R. 2 E., Sec. 28	1930	200	1	1	1927	R.petiolare R.inerme R.viscosissimum R.lacustre
Deep-Elk Creek, T. 39 N., R. 2 E., Sec. 14	1929 1930	612	306 (Est.)	1,251 (Est.)	1923	R.petiolare R.irriguum R.viscosissimum R.lacustre
Long Meadow-Three Bear Creek, T. 39 N., R. 1 E., Sec. 14	1929 1930 1931	1,422	341	227,683 (Est.)	1923	R.viscosissimum R.lacustre
Clearwater Timber Protective Association						
Deer Creek, T. 38 N., R. 5 E., Sec. 23 and 26	1931	1,000	166	310	1923	R.petiolare R.lacustre
Rhodes Creek, T. 37 N., R. 5 E., Sec. 36	1930 1931	1,000	105	328	1923	R.petiolare R.viscosissimum R. lacustre
Parallel Creek, T. 38 N., R. 5 E., Sec. 8	1931	100	4	11	1927	R.petiolare R.viscosissimum R.lacustre

TABLE NO. 1 (continued)

KNOWN PINE INFECTION CENTERS IN THE INLAND EMPIRE

Clearwater Timber Protective Association (continued)

Location	Year Found	No. Pines Examined	No. Pines Infected	No. Cankers	Probable Year of Origin	Associated Ribes
Casey Creek, T. 38 N., R. 5 E., Sec. 5	1931	100	1	1	1927	R. petiolare R. viscosissimum R. lacustre
South Fork Reed's Creek, T. 38 N., R. 5 E., Sec. 22	1931	300	28	40	1927	R. petiolare R. lacustre
South Fork Reed's Creek, T. 38 N., R. 5 E., Sec. 26	1931	100	2	2	1927	R. petiolare R. lacustre
Snake Creek, T. 38 N., R. 4 E., Sec. 36	1931	300	76	141	1923	R. petiolare R. lacustre
Quartz Creek, T. 37 N., R. 5 E., Sec. 9	1930 1931	500	40	48	1927	R. petiolare R. lacustre
Poorman Creek, T. 37 N., R. 4 E., Sec. 13	1931	1,000	1	1	1927	R. petiolare R. lacustre
North Fork Reed's Creek, T. 38 N., R. 5 E., Sec. 15	1930	50	7	68	1927	R. petiolare R. lacustre
North Fork Reed's Creek, T. 38 N., R. 5 E., Sec. 16	1929 1930	50	6	64	1927	R. petiolare R. lacustre
Orofino Creek, T. 36 N., R. 5 E., Sec. 13	1930	300	13	36	1928	R. petiolare R. viscosissimum R. lacustre
Clearwater National Forest						
Beaver Creek, T. 40 N., R. 7 E., Sec. 7	1930	10	4	80	1927	R. petiolare R. lacustre
Weitas Creek, T. 37 N., R. 8 E., Sec. 10	1931	?	1 (Inc.)	1 (Inc.)	? 1927	R. petiolare R. viscosissimum R. lacustre
Northeastern Washington						
Newman Lake, Washington, T. 27 N., R. 45 E., Sec. 32, 33 T. 26 N., R. 45 E., Sec. 4 & 5	1929 1930 1931	1,225	122	1,821	1923	R. inerme R. lacustre

The distribution of the known centers by forest units is as follows:

St. Joe National Forest	25
Potlatch Timber Protective Association	13
Clearwater Timber Protective Association	12
Coeur d'Alene Timber Protective Association	6
Coeur d'Alene National Forest	2
Clearwater National Forest	2
Newman Lake, Washington	1
Total	61

From data at hand it has been determined that the disease made its first invasion of the Inland Empire in 1923. Of the 60 known pine infection

centers in the R. petiolare belt 10 centers were started at that time. The 50 centers of later origin (1926-1928) all appear to have been started by the 1923 centers. If our scouting results from the small area covered are representative of general conditions in the R. petiolare belt, there have been in 3 years (1926-1928) at least five new centers started for each old center.

Based on studies made at each center located, the 60 known pine infections have been classified according to the Ribes species probably responsible for introducing the disease at each point and the probable year the center was started. This classification is shown in Table No. 2.

TABLE NO. 2

THE 60 KNOWN PINE INFECTION CENTERS WITHIN THE R. PETIOLARE BELT, CLASSIFIED BY RIBES SPECIES PROBABLY INTRODUCING THE DISEASE AND PROBABLE YEAR ORIGIN OF EACH

Ribes Species	R. petiolare			R. viscosissimum			R. irriguum		
Probable Year Origin	1923	Since 1923	Total	1923	Since 1923	Total	1923	Since 1923	Total
Number Infections	9	42	51	1	6	7	0	2	2
Per Cent Infections	90	84	85	10	12	12	0	4	3

From this table it is evident that R. petiolare has been the major species responsible for both the introduction and spread of the disease in the white pine belt. However, we must take cognizance of the fact that 10 per cent of the old centers and 15 per cent of the total centers found within this belt have been started by Ribes species other than R. petiolare. This fact indicates that although R. petiolare has been the host responsible for the occurrence of most of the known infection centers the presence of other Ribes species in stands of white pine will eventually cause considerable pine infection where the disease is already established in the vicinity. In other words, R. petiolare is probably the best wild host for receiving aeciospores from distant pine infections but once the disease becomes established on pines, the factor of Ribes species loses much of its significance and quantity of Ribes of any species becomes very important. This fact is brought out in the study of the Fishhook Creek infection on the St. Joe National Forest.

In 1923 this center of infection was started by a small clump of R. petiolare growing in a marshy seep on the slope about half way between the creek and the ridge. From this small center the disease has spread over approximately 100 acres infecting about 40 per cent of the trees. The canker increase has been at the rate of approximately 3,000 cankers of 1926-1928 origin for each canker started in 1923. A survey of 24 acres in this area showed the following distribution of Ribes live stem per acre.

R. lacustre	13,761
R. irriguum	414
R. petiolare	383
R. viscosissimum	35
All species	14,593

Thus it is seen that the Fishhook Creek infection, although started by R. petiolare which represents less than 3 per cent of the Ribes population there, has enlarged to enormous proportions, chiefly through the medium of Ribes species other than R. petiolare.

Fifteen thousand feet of Ribes live stem per acre of any species represents a tremendous blister rust hazard if the Long Meadow infection data are considered. On this area less than 1,300 feet of R. lacustre and R. viscosissimum per acre both introduced the disease and increased the cankers at the rate of 2,742 in the period 1926-1928 to 1 in 1923. If less than 9 per cent of the Ribes live stem growing on the Fishhook Creek area, irrespective of species, is capable of intensifying the rust at approximately the same rate as at present, it follows that we have provided only a very small amount of protection to many of the areas where eradication work has been done.

QUARANTINE INTERCEPTIONS AT THE NORTHERN BORDER STATIONS

G. A. Root

It may be of some interest to note the number of lots of pine and Ribes which were intercepted at the six northern quarantine stations on the California-Oregon line during 1931. It is at these points that infected material may at some time be found, rather than at the other stations on the eastern and southern borders.

The information put in tabular form is as follows:

Month	No. Lots		Month	No. Lots		Month	No. Lots	
	Pine	Ribes		Pine	Ribes		Pine	Ribes
January	8	3	May	8	11	September	14	1
February	3	-	June	15	4	October	8	1
March	3	10	July	22	7	November	3	-
April	6	31	August	14	3	December	3	1
Total	20	44		59	25		28	3

There is thus a total of 107 lots of pine and 72 lots of Ribes intercepted. Most of them came from Oregon and Washington. It is not known just how many originated in heavily infested areas in these respective states.

RATING OF THE AUTHORS

The annual check-up on the literary efforts of the office personnel as reflected by contributions to the Western Blister Rust News Letter has been completed for 1931. The same method of computation was used for the 1931 work as was used for 1930, i.e., "page inches". In this method only the space actually covered is measured, the upper and lower margins being disregarded.

The figures show that a total of 1,071.75 page inches of material were contributed in 1931 by 24 authors, counting all temporary employees as one and all news from outside the Blister Rust organization as one. The check-up also discloses that the News Letter enjoyed a fair growth during the past year

of depression. In 1930, 945.25 page inches of news were published in 12 issues, averaging 9-7/12 pages, a total of 115 pages during the year; while in 1931 only 11 issues were printed averaging, however, 12-1/11 pages per issue or a total of 133 pages.

In the following table the 24 contributors are listed. If each had shared an equal part of the burden, he would have contributed 44.65 page inches. The double line across the table is the average line and all those whose names appear below the line are holding back on some information this organization would be interested in reading.

Name	Page Inches	Per Cent of Yearly Total
Miller, Kermit	196	18.28
Putnam, H. N.	168-1/4	15.70
Harris, T. H.	62-3/4	5.85
Root, G. A.	59-1/4	5.53
Strong, C. C.	58-1/2	5.46
McWold, M. L.	56-1/2	5.27
Myers, R. E.	50-1/2	4.71
Benedict, W. V.	48-1/2	4.53
All Temporary Men	47-1/2	4.43
Riley, M. C.	44-1/2	4.15
Johnson, C. H.	34-3/4	3.24
Guernsey, W. G.	34-1/4	3.20
Goodding, L. N.	29	2.71
Anderson, B. A.	25-1/2	2.38
Swanson, H. E.	25-1/2	2.38
Van Atta, G. R.	20-3/4	1.94
Breakey, J. F.	20	1.87
Nelson, Neal	17-1/2	1.63
Patty, F. A.	16-1/4	1.52
Joy, E. L.	14-1/2	1.35
Miller, D. R.	12	1.12
Staat, F. F.	10-1/2	.98
Outside Sources	10-1/2	.98
Offord, H. R.	8-1/2	.79
Totals	1,071-3/4	100.00

WORK OUT 1932 PLANS

A meeting of representatives of the Forest Service, Clearwater and Potlatch Timber Protective Associations, Potlatch Forests, Inc., Ben Bush, Idaho State Forester, and S. N. Wyckoff, C. C. Strong and B. A. Anderson of this office was held at Lewiston, Idaho, February 23 to discuss plans for the 1932 field season.

The type of labor to be used, the scale of wages to be paid and the manner in which blister rust employment can best fit in with unemployment relief were the three major issues under consideration.

The Spokane delegation stopped over in Moscow, Idaho February 24 to discuss with Mr. Bush the 1932 work on the Priest Lake Timber Protective Association.

"ol. 7 No. 3

March, 1932

W E S T E R N B L I S T E R R U S T

N E W S L E T T E R

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

"LET US THEN BE UP AND DOING"

R. L. MacLeod

There are at least two kinds of laziness: physical and mental. Possibly there is a third; perhaps the man who decides on Saturday that he will go to church the next day and doesn't quite make the grade on Sunday, is manifesting spiritual laziness. This laziness, however, is probably both physical and mental with the admixture of a certain amount of sleepiness. In general, laziness is either physical or mental.

The man who has physical driving power may be mentally moribund; the man who is mentally alert may suffer from physical lassitude. Which condition is the more reprehensible? Each type will decry the attitude of the other. Each is right; each is wrong. Each is narrow-minded.

Narrow-mindedness leads to intolerance. Mr. Intolerance sees one fault and will not consider several atoning virtues; he cannot see the results of a ninety per cent mental efficiency on account of a myopic view of physical efficiency; he "damns with faint praise" experimental equipment or new methods which have possibilities of development merely because the initial test seemed to be a failure.

Our personnel conference has shown that much remains to be done. For a whole week we consider and attempt to understand the problems of each project in its relation to the others. Then we return, each to his own little rut, for the other fifty-one weeks of the year. We have discussed some of the things which we "should do." It will take a physical and mental alertness, an understanding of the other fellow's problem and a broad-minded spirit of cooperation to cut the "should" out of "should do" and get down to the "do".

Our personnel conference has shown that we need to throw off our coats and go to work; some of us have thrown off our coats.

A STUDY OF THE RELATIONSHIP BETWEEN RELATIVE HUMIDITY AND PINE INFECTION IN IDAHO

H. N. Putnam

There are two principal factors causing widespread blister rust infection of pines. These two factors are: (1) abundance of aeciospores to infect the Ribes; and (2) favorable weather conditions consisting principally of moist periods, or periods of high relative humidity.

Results of analyses of cankers found at various infection points in the Inland Empire indicate quite conclusively that infection was introduced into this region in 1923; that a small number of cankers originated in 1926; that the year 1927 was the year of origin of a large number of cankers; and that 1928 was also a year of good pine infection. This paper constitutes a study of the relationship between summer seasons of high

relative humidity and resulting pine infection, or, a study of the effect of the second factor mentioned in the first paragraph.

The effect of the first factor, abundance of aecia, must not be forgotten. The amount of aecia causing the 1923 infections was necessarily very small because they came from some distance away. By 1926 cankers originating in 1923 fruited for the first time and liberated a certain amount of aecia. In 1927 and 1928 the volume of aecia was increasingly larger, formed in cankers already fruited in 1926 and additional cankers fruiting in 1927 and 1928.

In studying the moisture factor, the hours of relative humidity 90% or more were obtained by simply scaling them off from hygrothermograph weekly charts recorded at Bovill, Idaho, during July, August and September, 1926 to 1930. Unfortunately it was not possible to obtain these records prior to 1926. The approximate period, July 1 to September 30 was used because the concensus of opinion of blister rust workers in the Division of Blister Rust Control and the Division of Forest Pathology was that such a period represented the range of time of sporidial infection of pines.

In searching for the best correlation of the relative humidity factor with pine infection the data for the five years have been analyzed from three standpoints:

1. Total number of hours of relative humidity 90% or more.
2. Total daylight hours of relative humidity 90% or more.
3. Lengths of periods of continuous relative humidity 90% or more.

In Table No. 1 the total length of time of high relative humidity is shown:

TABLE NO. 1

TOTAL LENGTH OF TIME OF HIGH RELATIVE HUMIDITY AT BOVILL, IDAHO, DURING MONTHS OF JULY, AUGUST AND SEPTEMBER, 1926 TO 1930, INCLUSIVE

Year	Period	No. Days	Total Hours	Total Hours Having Relative Humidity 90% or More	% of Total Hours Having Relative Humidity 90% or More	Relative Abundance of Cankers Formed in Year Shown
1926	6/29-9/27	91	2,184	442	20.24	Very few.
1927	6/28-9/26	91	2,184	938	42.95	Very many.
1928	7/3-10/1	91	2,184	703	32.19	Many.
1929	7/2-9/30	91	2,184	737	33.75	?
1930	7/1-9/29	91	2,184	749	34.30	?

It may be observed from Table No. 1 that 1927 stands out as the year with the greatest length of time of high relative humidity, having somewhat more than twice the number of hours of high relative humidity that

occurred in 1926. In 1928, 1929 and 1930 the length of time of high relative humidity was quite consistently half way between that of 1926 and that of 1927.

In Table No. 2 data are shown concerning the total number of daylight hours of high relative humidity:

TABLE NO. 2

ANALYSIS OF HIGH RELATIVE HUMIDITIES AT BOVILL, IDAHO DURING DAYLIGHT HOURS JULY, AUGUST AND SEPTEMBER, 1926 TO 1930

Year	Period	No. Days	Total Day-light Hours	Total Daylight Hours 90 Per Cent or More Relative Humidity	Per Cent of Total Daylight Hours Having Relative Hum. 90% or More	Relative Abundance of Cankers Formed in Year Shown
1926	6/29-9/27	91	1,289	32.0	2.48	Very few.
1927	6/28-9/26	91	1,292	197.5	15.29	Very many.
1928	7/3-10/1	91	1,275	120.5	9.45	Many.
1929	7/2-9/30	91	1,279	116.5	9.11	?
1930	7/1-9/29	91	1,283	110.5	8.61	?

That there was a decided difference in the number of daylight hours of high relative humidity during each of the five years is shown in Table No. 2. Practically all of the daylight hours of high relative humidity 90% or more came shortly after sunrise except in the case of rain storms.

The importance of relative humidity in the daytime hours comes in the relationship between the behavior of stomata on pine needles and daylight. No information regarding this relationship is available. However, it is highly possible that the stomata on pine needles close at night as they do on many plants. If sporidia can only germinate and send germ tubes into a needle through open stomata, this matter of sporidial behavior in regard to relative humidity becomes very significant.

That there is a close relationship between the infection of wheat by Puccinia graminis, and the behavior of stomata is evidenced by the following quotation from Technical Bulletin No. 266 issued December, 1931 entitled "Morphologic and Physicologic Studies on Stem-Rust Resistance in Cereals" by Helen Hart:

"Since the germ tubes of Puccinia graminis enter the wheat plant only through the stomata, it seems likely that stomatal behavior may have an influence on rust infection. ***The writer (Helen Hart) found that the germ tubes of stem rust enter the cereals only through open stomata, for, apparently, they are unable to force their way between the guard cells when the stomata is

closed. Consequently, infection occurs only during certain favorable periods--that is, while there is sufficient moisture for the germination of spores and the survival of germ tubes--while temperature is favorable for spore germination and growth of germ tubes, and while the stomata are open so as to permit the entry of germ tubes. *** Although many spores may germinate during the night, none of the germ tubes can enter the host until the stomata open the following morning. Thus the critical period for infection is the time between sunrise and the disappearance of the heavy dew, after which the delicate fungus germ tubes on the plant surfaces perish."

If the stomata on pine needles correspond in their actions to stomata on wheat, and if the germination and growth of aecia and uredinia of <u>Puccinia graminis</u> correspond to those of sporidia of <u>Cronartium ribicola</u>, it would appear that high relative humidity during the daytime hours, particularly in the morning, would be much more important than high relative humidity during the night.

In Table No. 2 it is apparent that there was a wide difference in the number of daylight hours of high relative humidity during the five years studied. In this connection it must be remembered that 1926 was a poor year for the rust to spread; that 1927 was an exceptionally good year and that 1928 was also a fairly good rust year. It is too early to determine from pine infections whether 1929 and 1930 were or were not good rust years but since they are each so similar to the year 1928, it is presumed that they also will be good years for the rust to spread.

In Table No. 3 there are shown data on the high relative humidities found during the night hours of the same periods under consideration:

TABLE NO. 3

ANALYSIS OF HIGH RELATIVE HUMIDITIES AT BOVILL, IDAHO, DURING NIGHT HOURS JULY, AUGUST, SEPTEMBER, 1926 TO 1930

Year	Period	No. Days	Night hours	Total Night Hours 90% or More Relative Humidity	Per Cent of Total Night Hours Having Relative Humidity 90% or More
1926	6/29-9/27	91	895	410.0	45.81
1927	6/28-9/26	91	892	740.5	83.02
1928	7/3-10/1	91	909	582.5	64.08
1929	7/2-9/30	91	905	620.5	68.56
1930	7/1-9/29	91	901	638.5	70.87

Table No. 3 is chiefly of interest to us in demonstrating in contrast to data shown in Table No. 2 that the total number of night hours of

high relative humidity did not vary so very greatly during the five years. Table No. 3 in comparison with Table No. 2 brings out more clearly the fact that the great variation in high relative humidities during five years came principally in the daylight hours.

In Table No. 4 there is presented information concerning the length of periods of continuous high relative humidity.

TABLE NO. 4

ANALYSIS OF PERIODS OF CONTINUOUS HIGH RELATIVE HUMIDITY AT BOVILL, IDAHO, DURING JULY, AUGUST AND SEPTEMBER 1926 TO 1930 INCLUSIVE

Year	Period	No. Days	No. of Periods of Rel. Hum. 90% or More	Aver. No. Hours of 90% Rel. Hum. for Period	Max. No. Hours Continuous Rel. Hum. 90% or More	% of Total Periods Having More Than 10 Hrs. of Con. Rel. Hum. 90% +	Relative Abundance of Cankers Formed in Year Shown
1926	6/29-9/27	91	78	5.7	11	2.6	Very few.
1927	6/28-9/26	91	90	10.4	43	45.6	Very many.
1928	7/3-10/1	91	89	7.9	27	15.7	Many.
1929	7/2-9/30	91	91	8.1	15	14.3	?
1930	7/1-9/29	91	91	8.2	21	16.5	?

It is thought that possibly the length of time of continuous high relative humidity was more important than the total number of hours of relative humidity. A long period of continuous high relative humidity presumably reacts on the telia to facilitate the germination of sporidia and also increases the length of time for the sporidia to survive to find the targets.

That there was a pronounced difference in the length of time of continuous high relative humidity is evidenced by the data in Table No. 4. Attention is directed to several points.

1. In 1927 the largest average number of hours of high relative humidity per period occurred followed by the years 1928 to 1930 as a group and with the smallest average number of hours of high relative humidity per period in 1926.

2. The year 1927 showed the maximum and the year 1926 showed the minimum number of hours of continuous high relative humidity.

3. In the per cent of total periods having more than ten hours of continuous high relative humidity the year 1926 showed only 2.6%.

In the year 1927 nearly half of the total periods were longer than ten hours of continuous high relative humidity. The years 1928 to 1930 were

very similar in the per cent of total periods having more than ten hours of continuous high relative humidity.

In summarizing this short study of the relationship between relative humidity and pine infection, the following points have been made:

1. In grading the years 1926 to 1930 on the basis of relative abundance of cankers formed each year, evidence at hand shows that very few cankers originated in 1926, many in 1928 and very many in 1927.

2. Relative humidity records were analyzed to find out for each year three things: (1) total hours of high relative humidity; (2) total daylight hours of high relative humidity; and (3) lengths of periods of continuous high relative humidity.

3. Under each method of treating the relative humidity factor the year 1926 showed the least number of hours of high humidity, the years 1928 to 1930 a larger number of hours, and the year 1927 the longest time of the five years. The number of cankers originating each year was directly proportional to the lengths of time of high relative humidity.

4. The number of daylight hours of high relative humidity showed the best correlation with relative number of cankers formed. This fact indicates the importance of a study of pine infection and the behavior of stomata on needles in daylight and darkness under varying conditions of relative humidity.

AN IMPORTANT QUARANTINE INTERCEPTION

G. A. Root

During the latter part of February, the California authorities intercepted in a shipment of several species of forest trees from the nursery of the Long-Bell Lumber Company at Ryderwood, Washington, 210 Idaho white and sugar pines. These were consigned to several nurseries and to Golden Gate Park at San Francisco.

It is a bit disquieting to know that a company of this size with extensive holdings of white and sugar pine should not have realized the possible danger of such a shipment. It may have been an oversight on their part for it is hard to believe that they have not been apprised of blister rust and the many protective measures to curb or retard its spread. But I am wondering whether nurseries growing 5-needled pines have been presented with enough information from time to time to keep them alive to the menace of blister rust and the many angles of protective measures. Personal visits by the proper authorities would aid a great deal.

SELECTING THE MOST SUITABLE TYPE OF LABOR FOR RIBES ERADICATION WORK

B. A. Anderson

An employment manager was at one time hiring several hundred laborers a day for a large construction project. Men filed by his desk

day in and day out and the manager accepted this man, rejected that one, and so on down the line. An interested observer finally asked him on what basis he picked his men. "Oh, that's fairly easy", replied the manager. "On Mondays I pick the men with blue eyes, on Tuesdays those with brown eyes, on Wednesdays those with red hair, etc." Carrying his ideas on picking men a little further we suppose at the present time, if he wished to balance the number of men accepted with the number of jobs available, he would limit his choice to albinos.

Every member of the Division of Blister Rust Control who has had charge of an eradication project has his own particular ideas of the qualifications of the ideal crewman, foreman, or camp boss. There are those who maintain that the men should be big and heavy so that when they grab a Ribes bush there is little question as to the outcome of the struggle; others require that the men be light and lithe so that they can get over the ground; still others want the young collegiate type and others care nothing for the educational angle but ask that the men be of the maturer, steadier type.

In order to find out what type of man has given the best satisfaction on eradication work, a study was made of about six hundred and eighty-one men who were employed during the 1930 and 1931 field seasons by this office. The records of these men were compared on a basis of age, weight and education.

Table No. 1 is a classification of 681 men classified according to their ages and the capacities in which they were employed and their degree of efficiency in those capacities.

TABLE NO. 1

CLASSIFICATION OF 681 MEN ON AN AGE BASIS

Age Group	Camp Bosses				Foremen				Laborers				Totals
	Exc.	Good	Fair	*N.W.	Exc.	Good	Fair	N.W.	Exc.	Good	Fair	N.W.	
Under 18					2	2			5	28	7	4	48
18 to 21	1		1		54	47	6	2	71	150	37	33	402
Over 21	29	17	3		26	31	5	5	30	55	13	17	231
Totals	30	17	4		82	80	11	7	106	233	57	54	681

*Not wanted.

Of the 681 men 218 or 32.0% were excellent.
330 " 48.5% " good.
72 " 10.6% " fair.
61 " 8.9% " not wanted.

A careful analysis of Table No. 1 shows that practically all camp boss material is secured in the over 21 age group and almost all foremen fall

in both the 18-21 and over 21 age groups. The men in the under 18 age group can be recommended principally as laborers of the average-good type. This same age group has only 14.6% of excellent men as compared with 32%, the general average of all the men. The men in the over 21 age group tend to be excellent or not wanted with fewer men in the good and fair classes.

The poorest showing has been made by men under 18; the men from 18 to 21 have performed very well but are lacking in camp boss material; the best showing has been made by men over 21. Since we have employed very few men over 30 years of age the ages of the men in the over 21 class would be principally between 21 and 30.

In the weight analysis of the men laborers and foremen only were considered. Table No. 2 classifies these men according to weight and their degree of excellence.

TABLE NO. 2

WEIGHT ANALYSIS

Weights	Total No. of Men	Excellent No. of Men	Excellent Per Cent	Good No. of Men	Good Per Cent	Fair No. of Men	Fair Per Cent	Not Wanted No. of Men	Not Wanted Per Cent	Per Cent of Total Men Employed
Laborers										
All classes	442	105	23.7	230	52.1	60	13.6	47	10.6	100.0
130-140#	60	13	21.6	25	41.6	11	18.4	11	18.4	13.6
141-150#	85	18	21.2	44	51.7	15	17.7	8	9.4	19.3
151-165#	165	37	22.4	92	55.8	21	12.7	15	9.1	37.3
166-180#	92	24	26.1	48	52.2	9	9.8	11	11.9	20.8
181-195#	32	9	28.1	19	59.4	3	9.4	1	3.1	7.2
196#-over	8	4	50.0	2	25.0	1	12.5	1	12.5	1.8
Foremen										
All classes	182	85	46.7	79	43.4	10	5.5	8	4.4	100.0
130-140#	14	5	35.7	8	57.2			1	7.1	7.7
141-150#	40	18	45.0	17	42.5	3	7.5	2	5.0	22.0
151-165#	77	31	40.2	41	53.3	2	2.6	3	3.9	42.3
166-180#	39	24	61.5	10	25.7	5	12.8			21.4
181-195#	8	6	75.0	1	12.5			1	12.5	4.4
196#-over	4	1	25.0	2	50.0			1	25.0	2.2

The data in Table No. 2 clearly favor the weight classes between 166-195#, although the 151-165# class also shows up quite well. Because of the small number of men represented in the 196# and over class I do not believe the figures in this group are reliable. We know that pulling Ribes bushes and carrying a loaded spray tank requires considerable

strength and stamina and have felt that the bigger man has been more satisfactory. This classification bears out that conviction.

Table No. 3 is an analysis of the men based on their education.

TABLE NO. 3

CLASSIFICATION OF 675 MEN ON AN EDUCATIONAL BASIS

Education Group	Camp Bosses				Foremen				Laborers				
	Exc.	Good	Fair	N. W.	Exc.	Good	Fair	N. W.	Exc.	Good	Fair	NW	Tot.
Grade School only	4		1		1				4	8	2	1	21
High School Undergrad.		1			2	2	3		9	35	14	3	69
High School Graduate	2	1			18	12			21	52	20	11	137
Forester Undergrad.	2	2			6	3			11	15	1	4	44
Forester Graduate	4		1			1		1		4			11
Non-forester Undergrad.	9	6	2		38	43	6	4	56	106	21	27	318
Non-forester Graduate	8	6	1		20	17	1	3	4	10	2	3	75
Totals	29	16	5		85	78	10	8	105	230	60	49	675

In my opinion, having a thorough knowledge of the men represented in the various groups, the analysis does not particularly favor any special group. The foresters and non-foresters have a little bit better record but this may be because they are of an older type than those men represented in the high school graduate and undergraduate classes. If a man is over 21 years of age, is big enough to bear up well under the work and is willing and intelligent, his chances for success in an eradication camp are not seriously hindered by lack of a college education. This finding was substantiated during the past season when a number of capable woodsmen with only a grade school education were used as camp bosses. These men, however, possessed two characteristics which play the most important part in the making of a successful camp boss or foreman - the ability to handle men and initiative.

WANTED: A "RESTRICTED VEGETARIAN" FOR RIBES

Clarence R. Quick

Between 1840 and 1850 a doctor migrating in a sailing ship from England to Australia carefully tended on the long voyage a strange xerophyte in a pot. He settled some 200 miles north of Sydney and his gardener, attracted by the unusual plant, succeeded in establishing it here and there with the thought that it might be of use as reserve food for stock

in dry years. Apparently other introductions of the same plant, the prickly-pear cactus (Opuntia inermis) were later made somewhat farther north in Australia.

The climate, soil, and freedom from serious pests favored the "pear" and by 1870 it was a plant pest out of control. In 1910, it was estimated that the cactus-overgrown areas were advancing at the rate of one million acres a year. In 1916, nearly 23 million acres were growing cactus thickets, while only about 17 million acres were growing crops in all Australia. During the years 1912-1914 there was collected from all over the world a great deal of information about the pest and the decision that the cactus must either be used economically or eradicated was reached. As research failed to find any use for the "pear" nothing remained but to attempt eradication.

Mechanical destruction by all available means, including heavy tractors, proved inadequate. Chemical poisoning by the injection and spraying of arsenical compounds proved technically effective, but was costly and dangerous. The use of poisonous vapors was tried, and abandoned.

Another method of attack, biological control, was decided upon. An experiment station was set up and plant and animal enemies of the pear were imported, mostly from the Americas, and were tested exhaustively. Cactoblastis cactorum, a moth native of Uruguay, the caterpillar of which is a "restricted vegetarian" and will eat nothing but a single plant species, the prickly-pear, was imported. The insect proved very successful and was bred artifically in great numbers. In 1930, only a few years after the importation of the twenty-five hundred moth eggs from Uruguay, there were distributed and liberated five million of the eggs in the cactus plagued area.

The Cactoblastis is very prolific in the field and there are now many thousands of millions of the insects eating out the interiors of the segments of the impenetrable jungles of cactus. "The terrific work of destruction proceeds silently, continuously, incessantly."

(Condensed with change of title, and other changes, from Reader's Digest, July, 1931, Vol. 19, No. 3, pp. 280-282, and Scientific American, June, 1931, Vol. 144, p. 393.)

ARE WE MAKING FULL USE OF THE WESTERN NEWS LETTER?

H. N. Putnam

During the course of the field season and in the process of analyzing data in preparation of annual reports many interesting correlations and specific indications or leads come to light. In this category might be listed such subjects as: the relation of relative humidity to pine infection; the relationship of amount of aecia with resultant amounts of Ribes infection; character of infection on different Ribes species; the average lengths of cankers of different ages; methods of expressing

Ribes leafage; the rate of damage to pines of different ages; Ribes seedlings following eradication, etc. Workers on projects other than the effectiveness of control can undoubtedly think of many other interesting topics.

Several of these subjects are included in the annual report. Others are not included but are simply suggested in the process of analyzing data for a specific report. All of us in the course of work at one time or another receive ideas and impressions which are supported to a greater or less degree by the data at hand. In our treatment of facts and indications we see in the course of our work we can do one or more of the following three things: (1) discuss the interesting point and not write it down; (2) analyze the data, make a report showing our conclusions based on the evidence and either show this information in the annual report or file a separate report; (3) we can write an article on the subject and insert it in the News Letter.

Our perhaps too common method of treatment of an interesting point is to discuss it and never do anything else with it. We spend a good share of the winter months in preparation of annual reports covering our activities. These reports from necessity must be as brief and to the point as possible and of necessity cover only the progress of our work towards its objective. Space is not given nor should it be given to the development of interesting side lights on a particular problem. A report on a particular subject not included in the annual report is placed in the files. Only a small percentage of the personnel read it or often know of its existence. Even the writer of such a paper sometimes forgets he has written it. The annual report of the western office is bulky, occupying 200 or 300 pages of single spaced typewriting. Very few of us are familiar with what is in the annual report. It is evident then that in the treatment of subjects either by discussing them or putting them out as separate reports or annual reports the subject matter can not receive very wide publicity among blister rust workers.

The means adopted for the dissemination of knowledge and the exchange of ideas among blister rust employees is the Western Blister Rust News Letter. Being strictly a house organ, it enjoys a very happy freedom of speech. In contrast with the annual report it is a small publication, each issue consisting of approximately 10 to 14 pages. It undoubtedly is read more or less completely by the great majority of all employees. Due to its freedom of speech and small size it serves as an excellent medium for the exchange of ideas and for the publication of subjects not fully proven as yet.

We should consider the News Letter as a heaven-sent opportunity to preserve ideas not fully proven but strongly indicated. In other words it constitutes an excellent storehouse for odd bits of information. Purely from a selfish standpoint we should make use of this means of preventing germs of ideas from becoming lost. In addition to this property of the News Letter of acting as a safety deposit vault for ideas valued at least by the originator, such ideas by virtue of being studied by interested and

intelligent coworkers can be developed and made of more value or shown up to be of no value.

It is a common sight to see the editor pacing up and down the hall feverishly looking for someone to write an article for the next issue of the News Letter. By dint of many and repeated urgings it is usually possible for the editor to persuade some of us to consent grudgingly to write sufficient articles to fill up the News Letter. The editor should not have to do this. In recognizing how fortunate we are to have such an excellent means at hand of distributing our ideas, the editor's desk should be so crowded with articles desiring admission to the News Letter that he would continuously be supplied with sufficient articles to fill up several months' issues ahead.

SYNOPSIS OF RECENT DECISIONS GENERAL ACCOUNTING OFFICE

A-38990. Traveling expenses - Mileage for use of own automobile - Tips to hotel porters.

Tips to hotel porters are expenses of transportation and may not be reimbursed to persons authorized to travel by their personally-owned automobiles at mileage rates as permitted by the Act of February 14, 1931, 46 Stat. 1103. October 30, 1931.

In enlarging upon this decision the Comptroller states in part as follows:

"Tips to hotel porters uniformly have been considered as expenses of transportation, 19 Comp. Dec. 218; Appeal No. 37176, August 9, 1921; and A-16347, December 7, 1926. See also paragraph 8 of the Standardized Government Travel Regulations. Paragraphs 12 and 12(a) of the Standardized Government Travel Regulations, regarding the use of personally-owned automobiles upon an actual expense basis and upon the mileage basis, respectively, are to be read in connection with the other provisions of the regulations. For instance, an employee authorized to use his automobile on an actual expense basis, while limited, so far as expenditures connected with his automobile are concerned, to the items permitted by paragraph 12, would be entitled to reimbursement, in addition to such expenses, for tips to hotel porters and other incidental expenses of transpotation. Paragraph 12(a) which is the regulation for mileage 'in lieu of actual expenses of transportation' must be read in connection with paragraph 8 defining transportation expenses. Accordingly, a Government officer or employee using his own automobile upon an authorized mileage basis is not entitled, in addition to such mileage, to reimbursement for tips to hotel porters."

A-39102. Traveling expenses - Mileage for use of own automobile - Ferry Fares.

The mileage allowance authorized by the Act of February 14, 1931, 46 Stat. 1103, for the use of an employee's own automobile is in lieu of all expenses of transportation and precludes any allowance

for ferry fares in addition to mileage. The mileage is to be computed over the distance actually traveled, including the distance traveled by ferries, even though such distance is not recorded upon the speedometer of the automobile. November 12, 1931.

JUST AN IDAHO INCIDENT

In one of H. E. Swanson's letters to the Spokane office last summer the following paragraph appeared:

"I am just leaving for the Bungalow Ranger Station and then 16 miles down the North Fork of the Clearwater River for a new experience in blister rust. We are unloading four pack string loads of equipment and supplies on one side of the river, rafting it across, then swimming one of the pack strings across and moving the stuff on the other side".

That was what was thought to have happened, but Swanson's account of what actually happened follows:

"During the previous three days of hot, dry weather the river had gone down. Packers are always ready to reduce the amount of work which they have to do. They decided to force their loaded mules across the few feet of deep water and eliminate the reloading on the other side. The ford was crossed without mishap. The few mules who did flounder were dragged through by their longer-legged brothers and sisters.

"However, the fun came one day later in a driving rain storm, when a party of eight rookies, mostly from the East, arrived at 10 p.m. on the far side of the river. When they could not find a bridge (imagine looking for a bridge out there!) they worked their way a quarter of a mile down river until they saw the lights of the newly erected camp on the far side. Four of us who were resting comfortably under canvas had nothing else to do but to answer the forlorn cry for help that came from the other shore. By midnight we had brought the eight rain-soaked and frozen men across the river. After sixteen trips, battling the current in total darkness and in a downpour of rain, we felt like seasoned 'river rats' and qualified skippers. We could take only one of the newcomers across at a time under the circumstances.

"These men let their zeal and ambition get the better of them when they disregarded instructions and left the Bungalow at 5 p.m. By sad experience they learned that a 16-mile hike is no promenade through a park."

BLISTER RUST MATERIAL IS LISTED UNDER GIFTS

G. A. Root

In a neat pamphlet entitled "Gifts Received by the University of Southern California", is listed among 250 items the following: "To the Department of Botany, white pine blister rust material to be used in advanced class work". This refers to the university educational sets which were given to the larger institutions of the state.

That so relatively small an item should receive recognition in printed form, shows an appreciation not always forthcoming from institutions of this class.

Vol. 7 No. 4

April, 1932

WESTERN BLISTER RUST NEWS LETTER

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Confidential

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

IMPERTINENCES ON BIOLOGICAL CONTROL

Leslie N. Goodding

Quick's article "Wanted: A Restricted Vegetarian for Ribes" should provoke thought. Biological control sounds fanciful to many blister rusters. Many do not realize, at least so I suspect, that the idea is far from new, that it constitutes the basis for extensive investigations on both plant and insect pests at present, and that it has been successfully applied in some of the most serious problems confronting agriculture and forestry.

Doctor Thompson, of the Imperial Bureau of Entomology, speaks of the controls of pests and diseases by mechanical means such as spraying, fumigation, etc., as being mere palliatives. Possibly he might add the eradication of Ribes by our own present methods. (Let us for the present think of the Ribes as the pest, for if we were well rid of it the blister rust would take care of itself.) We work to get out the Ribes from a certain area, but we must recognize our problem to be one that is unending. If we eradicate the Ribes in a region where the forest is established, our work must be repeated after the first logging operation or after the first fire. Gravity, winds, streams, animals, and birds all tend to undo the work we have accomplished, and areas clean today are Ribes infested tomorrow.

If one should suggest such a thing as an insect to work on Ribes, at once the cohorts of calamity would say that it would jeopardize the currant and gooseberry industry. I have before me a small circular "Insect Pests and Diseases of Currants and Gooseberries". Here are listed eleven insects and insect relatives which must be controlled in order to raise currants and gooseberries successfully in Oregon. Besides these we have four fungous diseases mentioned. If a control program is applied with which these pests can successfully be handled, the chances are mighty strong that any insect pest introduced to destroy Ribes generally could be similarly controlled. This is true; however, the issue would have to be faced, not evaded.

In the forest we must consider Ribes as weeds and handle them accordingly. To suggest possibilities of control, I wish to mention some noxious weeds that have been handled by means of phytophagous insects and some on which work is being attempted. Some of the initial work along this line was done in Hawaii in the control of Lantana, and the Hawaiian Sugar Planters' Association has been active since in the control of other pest plants. Plant pest control work has been taken up in Australia and New Zealand with vigor. The most outstanding work outside that discussed by Quick is being carried on in an effort to control the blackberry, the gorse, and ragworth in New Zealand. Some effort is being made to control the St. John's wort in Australia and the foxglove and bracken in New Zealand. While biological control is practiced extensively with insect pests, much less has been done with pest plants. While examples are less striking in plant work, it must be remembered that comparatively little work has been done until recently and even at present efforts are desultory and for the most part poorly financed. In glancing over work undertaken by the Farnham House laboratory in England, I noticed that the coddling moth is being

studied in its relation to eleven species of parasites; the wooly aphis of apple, on which some very satisfactory control work has been accomplished particularly in New Zealand; the pear slug, with four Ichneumonid parasites, is under observation; the hazel-nut scale; the oriental peach moth; the leaf-curling pear midge; the pine shoot moth on which control work has been started in Canada; the wood wasps with promising results in New Zealand; the larch case bearer; and some fifteen others infesting fruits, grains, and forest trees.

Of course, a classic example of insect control is that of the cottony-cushion scale in California by the introduction of the coccinellid beetle, Vedalia cardinalis, and the history of biological control of insect pests in the Hawaiian Islands reads like a fairy tale.

In a forthcoming news letter I wish to discuss the methods followed in the investigation of gorse control.

ANALYSIS OF INFECTION ON R. LACUSTRE AND R. VISCOSISSIMUM

H. N. Putnam

On August 21, 1929 a very severe pine infection was discovered at Long Meadow Creek, near Elk River, Idaho. The infection was chargeable only to R. lacustre and R. viscosissimum, two Ribes species believed to be comparatively low in susceptibility to the rust in the West. During the latter part of August and the first part of September of 1929, infection was studied on these two species on 4.1 acres immediately surrounding a well established pine infection center of 1923 origin. In this study, analysis of infection was made on 78 bushes of R. lacustre and 12 bushes of R. viscosissimum.

Attention is directed to the following points in the table in which an analysis of the infection found is shown.

1. The great majority of the R. lacustre and all of the R. viscosissimum bushes were found growing in the shade or half shade.

2. On equal areas of leaf surface there was over 12 times as much infection on R. viscosissimum as on R. lacustre.

3. In regard to R. lacustre, the smallest amount of infection per total leaf surface was found on the open grown form. On equal amounts of leaf surface taking the amount of infection on the open form as one unit, we find there are approximately 26 infection units on the half-shade form and 113 units on the full shade form. In the case of R. viscosissimum the intensity of infection on the half-shade and shade forms is reversed, the amount of infection on the half-shade form being nearly 3 times that found on the same amount of leaf surface in the full shade.

4. Although the intensity of total infection on R. lacustre was decidedly less than on R. viscosissimum the relative production of telia was surprisingly much greater on R. lacustre. Practically 40 per cent of the infected surface of

R. lacustre and only 9 per cent of that of R. viscosissimum produced telia. This high production of telia on R. lacustre was contrary to our previously conceived ideas concerning the ability of the rust on R. lacustre to produce telia. The reasons for this high production of telia on a species previously thought to be very low in this capacity are not known. Two surmises can be offered: (1) an especially virulent strain of R. lacustre occurred on the Long Meadow area, and (2) environmental factors were especially favorable. In order to shed light on this point a few heavily infected R. lacustre bushes from Long Meadow were planted in a defoliated condition on the Newman Lake infection area in the fall of 1929. Unfortunately these bushes failed to live.

The only other detailed studies of Ribes infection in 1929 by the Division of Blister Rust Control were made on R. lacustre at Newman Lake. These studies were made in July and August and in point of time were not strictly comparable to studies made at Long Meadow in late August and early September. However, their comparison might be interesting. The six infected bushes at Newman Lake were all located within two and a half chains or less from fruiting cankers. The 36 infected R. lacustre bushes at Long Meadow were located four chains or less from fruiting cankers.

At Newman Lake 19 cankers producing aecia in 1929 were responsible for a calculated total of .85 of one leaf 100 per cent infected. At Long Meadow a calculated total of 60 fruiting cankers was responsible for a calculated total of 299.86 R. lacustre leaves 100 per cent infected. In other words for every one fruiting canker at Newman Lake there was a calculated total of 1.04 R. lacustre leaves 100 per cent infected while at Long Meadow for every fruiting canker there were 5 R. lacustre leaves 100 per cent infected. Thus for equal amounts of aecia there resulted 125 times as much R. lacustre infection at Long Meadow as at Newman Lake.

The production of telia was also very much higher at Long Meadow than at Newman Lake. At the former point 39.9 per cent and at Newman Lake 2.4 per cent of the infected leaf surface produced telia. In other words for equal amounts of aecia there were 2,078 times as many telia produced at Long Meadow as at Newman Lake.

Studies by the Division of Forest Pathology have also shown a wide variation in the ability of R. lacustre to produce telia. In their studies in eastern British Columbia, R. lacustre has been shown to be extremely low in its ability to produce telia. On the other hand their studies also made in eastern British Columbia, concerning the spread of infection from R. lacustre to pines, have demonstrated a pronounced ability of small amount of R. lacustre to cause appreciable damage to pines from one wave of infection for distances up to 100 feet from the infecting bushes.

It is apparent that R. lacustre varies very greatly in its ability to produce telia and cause pine infection. The reasons for this great variation are not known, but it is certain that we must consider this species an unexpectedly important factor in the spread and intensification of the rust and we must deal with it accordingly.

ANALYSIS OF RIBES INFECTION ON 4.1 ACRES
SURROUNDING THE ORIGINALLY FOUND 1923 CENTER OF INFECTION,
LONG MEADOW CREEK, IDAHO, AUGUST, 1929

Ribes Species	Shade Form	Bushes			Leaves			Infection Expressed as Equiv. Number of Leaves 100 Per Cent Infected				Parts Infected Per Thousand Parts Total Leaf Surface Examined
		Exam.	Infected	Per Cent Infected	Exam.	Infected	Per Cent Infected	Uredinia	Telia	Necrotic	Total	
R. lacustre	Open	3	1	33	1,380	12	.9	.02	.02	.32	.36	.26
	Half Shade	52	24	46	20,149	2,534	12.6	12.35	57.04	62.78	132.17	6.56
	Shade	16	9	56	5,003	1,627	32.5	13.20	48.38	84.91	146.49	29.28
	Not Known	7	2	29	12,495	2,028	16.2	8.13	12.12	.59	20.84	1.67
	All Forms	78	36	46	39,027	6,201	15.9	33.70	117.56	148.60	299.86	7.68
R. viscosissimum	Half Shade	7	7	100	240	173	72.1	5.62	6.23	17.42	29.27	121.96
	Shade	5	3	60	137	67	48.9	.59	2.33	2.92	5.84	42.63
	All Forms	12	10	83	377	240	63.7	6.21	8.56	20.34	35.11	93.13
Both Species	All Forms	90	46	51	39,404	6,441	16.4	39.91	126.12	168.94	334.97	8.50

AN ANALYSIS OF CALIFORNIA RECONNAISSANCE TIMBER DATA

Roy Blomstrom

In an effort to provide more concrete information relative to the abundance and distribution of sugar pine in the mixed conifer timber stands of California, the writer has analyzed and compared control reconnaissance timber data for the Stanislaus, Eldorado, Plumas, Lassen and Klamath National Forests. The first four forests are located in the Sierra Nevadas while the fifth, the Klamath, includes portions of the coast range mountains just south of the Oregon line.

Although the intensity of timber sampling is only one-half of one per cent and for this reason not applicable to small areas, it is, when applied to the 372,588 acres of sugar pine type included in this analysis, sufficiently comprehensive to yield valuable information. A one-half of one per cent cruise of 372,588 acres is in effect a 100 per cent cruise of 1,862.4 acres which are widely scattered over the sugar pine belt and thus representative of average growing conditions.

The results of this study are shown in Table No. 1.

TABLE NO. 1

NUMBER OF SUGAR PINES PER ACRE BY DIAMETER CLASSES

SP-YP Type

Forest	Acres of Type	Acres in Sample	Trees Per Acre by Diameter Classes							
			0-1"		1" to 6"		6" to 12"		Over 12"	
			Sugar Pine	Others	Sugar Pine	Others	Sugar Pine	Others	Sugar Pine	Others
Stanislaus	41,787	208.9	139.6	1,178.8	37.4	313.1	7.5	55.2	5.4	28.2
Eldorado	37,932	189.6	111.0	699.6	32.6	209.4	3.2	24.6	6.6	29.9
Plumas	50,578	252.8	117.3	1,324.9	34.1	260.2	7.8	39.5	10.4	46.0
Lassen	49,598	247.9	129.9	1,233.5	40.4	295.1	5.5	26.5	9.2	31.6
Klamath	23,698	118.4	164.8	652.9	33.7	135.0	5.5	24.3	10.4	33.0
Average	203,593	1,017.6	129.3	1,077.9	35.9	261.3	6.0	35.0	8.4	34.3
SP-F Type										
Stanislaus	23,063	115.3	104.0	835.6	47.8	498.6	14.2	91.7	9.5	34.5
Eldorado	44,077	220.3	103.4	788.2	42.8	377.3	4.9	38.2	8.3	35.7
Plumas	34,682	173.4	63.8	1,248.3	26.7	324.5	6.6	50.6	9.5	41.1
Lassen	45,829	229.1	106.9	1,355.5	33.8	363.1	5.8	30.3	11.3	36.8
Klamath	21,344	106.7	103.2	523.0	27.6	176.8	4.3	28.1	11.0	37.6
Average	168,995	844.8	96.3	1,009.4	35.8	353.8	6.7	44.6	9.9	37.0

The weighted average of both timber types in the foregoing table shows that out of every 100 sugar pine seedlings an average of eight reach maturity; while in the species other than sugar pine, chiefly yellow pine, incense cedar, white fir and Douglas fir, only 3.4 out of every 100 reach a size of 12 inches or over. This clearly demonstrates the ability of sugar pine to

withstand crowding, shading, and root competition and forge ahead in the stand at the expense of the other species.

Contrary to current belief there are more sugar pine seedlings per acre in the sugar pine-yellow pine type than in the sugar pine-fir type. However, there is a greater mortality in the larger diameter classes of the sugar pine-yellow pine type which is probably due to the lack of moisture rather than overcrowding or shading.

The amount of sugar pine advance reproduction in a stand is nearly uniform in all the forests. The variance in number of trees in species other than sugar pine is somewhat larger.

The decrease in number of trees from the seedling class to the 6 to 12 inch class and the subsequent rise in numbers in the over 12 inch class is constant and common to all forests. The increase in numbers of trees in the over 12 inch diameter class is likely due to the larger range of diameters in this class.

Another interesting fact brought out in Table No. 1 is the sudden drop in number of tree species other than sugar pine from the seedling stage to the subsequent diameter classes. Plotted graphically the drop is nearly a straight line from the 0 to 1 inch class to the 6 to 12 inch class with a decided break at the over 12 inch class. With sugar pine the change is more gradual indicating a decided lower mortality.

Table No. 2 shows the percentage of sugar pine in the different diameter classes for the several forests studied.

TABLE NO. 2

PERCENTAGE OF SUGAR PINE BY DIAMETER CLASSES

SP-YP Type

Forest	Per Cent of Sugar Pine by Diameter Classes				Per Cent of Sugar Pine Regardless of Diameter Class
	0 to 1"	1 to 6"	6 to 12"	Over 12"	
Stanislaus	10.6	10.7	11.9	16.2	10.8
Eldorado	13.7	13.5	11.4	18.1	13.7
Plumas	8.1	11.6	16.4	18.4	9.2
Lassen	9.5	12.1	17.3	22.7	10.5
Klamath	20.1	15.4	18.6	23.2	19.3
Average	10.7	12.1	14.6	19.7	11.3
SP-Fir Type					
Stanislaus	10.1	8.7	13.4	21.6	10.7
Eldorado	11.6	10.2	11.4	18.8	11.4
Plumas	4.9	7.6	11.5	18.8	6.0
Lassen	7.3	8.5	16.1	23.5	8.1
Klamath	16.4	13.5	13.3	22.7	16.0
Average	8.7	9.2	13.1	21.1	9.3

An almost constant increase in percentage of sugar pine is shown from the seedling class to maturity. This varies from one and a half to three times. The percentage of sugar pine in each diameter class is remarkably consistent for all the forests of the Sierra Nevada mountains. The discrepancy on the Klamath is largely caused by one region of this forest which supported a high percentage of poor quality sugar pine. The trees other than sugar pine are evidently too crowded for survival, hence the rise in the percentage of sugar pine in the larger diameter classes.

In the diameter class of 12 inches or over 20 per cent of the trees by number are sugar pine. This undoubtedly means a much higher percentage of sugar pine by volume because sugar pines are usually larger than associated tree species.

The forester of tomorrow need not be concerned if only a few sugar pine seedlings occur in the stand. With a nearly uniform stand of advance reproduction present, a low rate of mortality, a marked tendency to withstand crowding and root competition from other trees, and a high percentage of original seedlings reaching maturity, the success of sugar pine in the stand is assured.

THE PERSONAL FACTOR IN THE TAKING OF RECONNAISSANCE DATA

T. H. Harris

In the taking of data men differ in their judgment, care and accuracy, and in method, even though the method is supposedly standardized. To determine somewhat the extent to which these differences affect final reconnaissance results, each crewman's timber data were compiled separately and the resulting percentages of sugar pine in SP-YP and SP-F types compared, as were also the average number of Ribes per acre obtained by each. The acres sampled by the men were, of course, not identical, and hence are not strictly comparable, but the large number of acres in each case probably results in a fair average. Figures for the Klamath National Forest, California, were used.

The table shows that the greatest difference in the average percentages of sugar pine for SP-YP type is 9.8, that between Mansfield's 13.3 per cent and French's 23.1 per cent. For SP-F the greatest difference is 9.1, that between Mansfield's 10.6 and Sowder's 19.7 (French a close second with 19.4). Thus by this criterion Mansfield's determinations are low and French and Sowder's high. These tendencies are readily traced in the figures for the diameter classes, the averages of which were just quoted.

The last column, giving the average number of Ribes per acre, shows a variation in SP-YP type of 41.5 bushes with Mansfield high (French second high) and McLees low. In SP-F the difference is 100.6 bushes per acre with French high (Mansfield second high) and McLees again

low. French has maintained his tendency to count high, but Mansfield has reversed his position from a low count of trees to a high count of Ribes.

Although part of these differences in the counts of the men may be due to the actual conditions on the ground sampled, they appear consistent enough to draw the conclusion that some men tend to count low and others high. To counteract these tendencies in their effect on the results, the possibility of applying a correction factor suggests itself. In this manner a greater degree of reliability and dependence might be placed on reconnaissance.

INDIVIDUAL TENDENCIES IN THE TAKING OF DATA AS REVEALED DIFFERENCES IN PERCENTAGES OF SUGAR PINE, KLAMATH NATIONAL FOREST, CALIFORNIA

PART A. SP-YP

Men	Acres Sampled	Percentage of SP by Diameter Classes 0-1"	1"- 6"	6" -12"	Over 12"	Average	Ribes Per Acre
Sowder	3,629	21.7	27.1	20.4	25.1	22.4	32.5
Mansfield	3,571	13.6	9.9	19.6	13.3	13.3	54.7
French	4,955	24.3	19.4	19.2	26.2	23.1	35.8
Blomstrom	3,007	20.9	11.9	18.3	35.3	18.6	31.6
McLees	5,309	17.2	12.2	12.5	24.6	16.8	13.2
Total or Average	20,471	20.1	15.4	17.1	24.1	19.3	29.1

PART B. SP-F

Men	Acres Sampled	Percentage of SP by Diameter Classes 0" -1"	1"- 6"	6"- 12"	Over 12"	Average	Ribes Per Acre
Sowder	4,642	21.1	9.5	15.20	25.5	19.7	46.3
Mansfield	3,229	11.8	9.6	.01	8.4	10.6	102.1
French	3,507	19.2	19.4	22.00	21.0	19.4	126.3
Blomstrom	2,813	14.2	12.2	19.40	27.3	14.2	55.3
McLees	2,842	15.0	12.1	10.40	24.1	14.8	25.7
Total or Average	17,033	17.0	13.5	13.40	21.8	16.3	71.4

LONG DISTANCE SPREAD OF CRONARTIUM OCCIDENTALE

Frank A. Patty

During the last four years observations have been made on the long distance spread of *Cronartium occidentale* from pinyon pines to *Ribes roezli* in the Strawberry area of the Stanislaus National Forest. The nearest known pines are thought to be more than 20 miles air line from the infected Ribes. However, there may be a few scattered pinyon pines that are not so far removed. All of the infections were on *R. roezli*

in spite of the fact that R. nevadense was closely associated with the former species at three of the inspection points.

The table shows the results of the observations that have been made from 1928 to 1931. In 1928 the rust was fairly common on R. roezli in this area, in 1929 it was very common, in 1930 only one leaf with three telia columns was observed, and in 1931 one bush with 60 infected leaves was found.

CRONARTIUM OCCIDENTALE INFECTION ON RIBES ROEZLI

Inspection Points	Years Infections Were Found			
	1928	1929	1930	1931
Cow Creek Plot	-	X	-	X
Upper Cow Creek	Not inspected	X	-	-
Punch Bowl	X	X	-	-
Leland Meadows	X	X	-	-
Section 2 road	-	X	X	-
Section 2 road near Y	X	X	-	-
Herring Creek	X	X	-	-
P, G. & E., Diversion Dam	X	-	-	-
Totals	5	7	1	1

X - Indicates one or more infected bushes were found in the immediate locality.

SURVEY OF PROPOSED NURSERY SITE AT RYDERWOOD, WASH.

C. C. Strong

In the late fall of 1928 the forester of the Long-Bell Lumber Company, Captain J. B. Woods, became interested in the proposition of protecting the company nursery at Ryderwood, Washington against possible damage by white pine blister rust to five-needled pine stock he planned to grow. At his request Goodding and Strong made a rather thorough survey of the nursery site and adjoining areas. It was found that the Ribes situation was such as to make control from blister rust very impracticable. Accordingly the idea of attempting the growing of five-needled pines in any quantity in the nursery was abandoned.

Quite recently Captain Woods became interested in the matter of growing the five-needled pine stock needed by the Long-Bell Lumber Company at some other point where control from blister rust might be secured at a low cost. He had in mind some accessible area within a reasonable working radius of the established nursery. At his request the Division of Blister Rust Control undertook the survey and Strong and Riley were assigned to the job. This survey is the subject of a special report made upon the completion of the work. A copy of this report is on file at the Spokane office.

OBSERVATIONS ON RUST PHENOLOGY

H. N. Putnam

On April 5 the writer had an opportunity to observe the development of cankers and the leafing out of Ribes on the Maple Falls-Kendall infection area, Whatcom County, northwestern Washington. The cankers had well developed blisters. The blisters had broken but practically no dissemination of aecia had occurred. The great majority of all cankers found were producing aecia. No cankers younger than the pycnial stage were seen.

R. sanguineum was in full flower and the leaves were nearly full grown. _R. lacustre_ was not yet in flower although flower buds were seen. The leaves were perhaps one-third grown.

On March 29, 1931, as recorded in the Western Blister Rust News Letter for April 1931, the blisters at this same point were broken with aecia mostly in place. _R. sanguineum_ was in full flower and the leaves half grown. The leaves on _R. lacustre_ were reported as one-fourth grown and no flowers were in evidence.

It is apparent that the development of the cankers and leafing out of Ribes on this area is quite similar in 1931 and 1932.

On April 11, 1932 E. L. Joy and the writer made the first visit of the season to the infection study plot at Newman Lake, Washington. Snow was still plainly visible and the small creek running through the plot was flooding the badly infected portion. Much more water was seen than has been observed since we first began studying the area. In the spring of 1931 there were planted at Newman Lake approximately 1,000 each of _P. strobus_ and _P. monticola_ and 350 _P. flexilis_. A check on the survival of these planted pines last fall showed only approximately 46 per cent survival. From a casual examination of the plantings made this spring it is apparent that large numbers failed to survive in the winter. There are probably not over 10 or 15 per cent of the planted pines now living. Many of them were completely under water and apparently still alive.

No _R. inerme_ was seen. The buds on _R. lacustre_ were still dormant on many bushes. On a few bushes the buds had just burst but not unfolded.

The majority of the cankers seen were still dormant. Possibly 25 per cent showed blisters through the cracks of the bark but very few of the blisters had pushed out through the bark and none of them had opened. No cankers younger than pycnial scars were seen.

On April 6, 1931 it is reported in the News Letter mentioned above that blisters on the cankers had pushed through the bark but none of them were seen broken. _R. lacustre_ leaf buds were just opening and _R. inerme_ leaves were about half grown.

It is apparent that the season was somewhat earlier in 1931 than in 1932 at Newman Lake.

FIGURES DON'T LIE

G. R. Van Atta

"We should consider the News Letter as a heaven-sent opportunity to preserve ideas not fully proven but strongly indicated."

If what follows seems fantastic, the blame for its utterance belongs in part to Putnam who voiced the opinion quoted above in the last News Letter. Put's touching picture of the fevered editor searching for contributions also deserves acknowledgement; however, it is doubtful that even such a powerful plea as that would of itself have precipitated this article if Andy had not broken the ice in the same issue with facts and figures reminiscent to the present writer of the Two Black Crows' argument concerning the gustatory habits of white horses and black horses.

For several weeks the Berkeley office has been concerned with a study of records of past experiments. Trials of chlorate sprays have been subjected to particular scrutiny. Efforts have been made to discover what quantitative relationship may exist between the effectiveness of treatment and the quantity of chemical applied in spray solutions. The figures given below, which are a composite of the results of all the single applications of experimental chlorate sprays tried by this project during the years 1925 to 1930 inclusive, are the partial outcome of one attempt to answer the question, "How much sodium chlorate must be applied as an aqueous spray to aerial plant parts to successfully accomplish the eradication of _Ribes inerme_ and _R. lacustre_?"

RELATION OF CONCENTRATION OF SODIUM CHLORATE IN SPRAY TO LIVE STEM KILL OF R. INERME AND R. LACUSTRE

Pounds of Sodium Chlorate Per Gallon of Water.	0.36	0.45	0.89	1.40	2.00	2.70	3.40
R. inerme mean per cent of live stem kill.	36.30	49.00	46.60	69.10	75.10	73.20	87.90
Number of points represented by mean.	7.00	9.00	6.00	11.00	17.00	54.00	12.00
R. lacustre mean per cent of live stem kill.	34.50	61.00	72.40	91.70	88.50	91.90	97.20
Number of points represented by mean.	6.00	11.00	14.00	7.00	16.00	23.00	9.00

Before making an attempt to interpret the figures given in the foregoing table, attention is called to the fact that the process by which these figures were derived violated every known existing principle of statistical analysis save one.

The percentages of live stem kill are the arithmetical means of as many heterogeneous collections of individual figures, some of which are

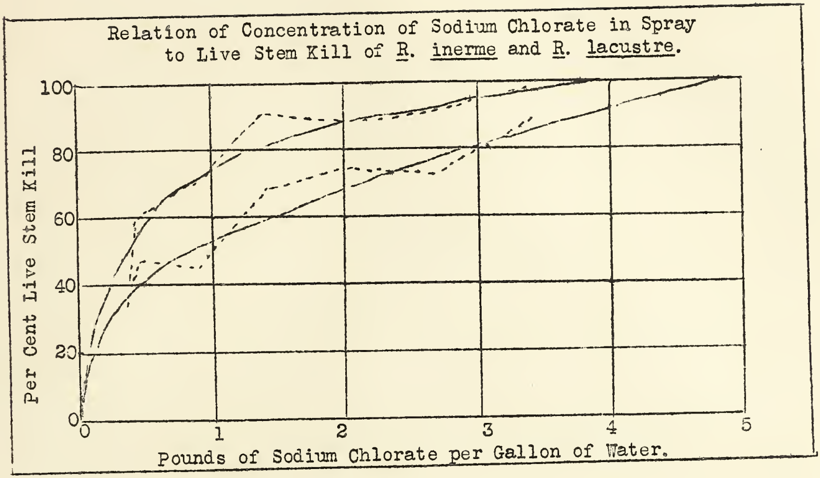
themselves weighted averages of a large number of identical treatments involving hundreds of plants, while others represent the results of experiments so small as to include less than ten plants. Furthermore, many of the individual figures from which the percentages of live stem kill shown in the table were computed vary tremendously from the mean, and many represent the results obtained by spraying plants with solutions of sodium chlorate to which other substances were added. The presence or absence of such substances in the sprays was purposely ignored in the derivation of the mean percentages given in the table. The results obtained by spraying with solutions of the same sodium chlorate content, or its weight equivalent of potassium chlorate were grouped together regardless of the pH of the individual spray solutions.

Site, season, plant vigor, volume of solution applied per plant unit and methods or efficiency of checking are only some of the other variables of which no account was taken. That at least some of these variables are capable of influencing the results of individual experiments, there can be little doubt. That they are, when taken collectively, relatively incapable of influencing the composite results of a great many individual treatments may seem an equivocal statement until it is explained that study of the available data seemed to show that whenever it was possible to compare the effects of individual variables, they tended generally to be mutually compensatory.

Having thus lightly disposed of all objections to the basis for these speculations, it is now possible to deduce an answer to the question, "How much sodium chlorate must be applied as an aqueous spray to aerial plant parts to successfully accomplish the eradication of R. inerme and R. lacustre?"

If the mean percentages of R. inerme live stem kill given in the table are plotted as ordinates and the corresponding figures representing the pounds of sodium chlorate per gallon of water, are plotted as abscissas and straight lines are then drawn to connect the adjacent points so located, a jagged line that wavers first to one side and then to another, like the faltering footsteps of an inebriate, will result. If the points are plotted in the first quadrant, the general course of the line will be at first steeply upward to the right from the origin. The slope is less steep toward the upper limit.

A similar, though a trifle less angular line can be drawn to correspond to the data given for R. lacustre. If, still disregarding all statistical refinements, smooth curves are drawn to roughly approximate the course of the two lines, they will, if projected beyond the upper ends of the curves, intersect the line representing 100 per cent live stem kill. Two such lines have been drawn. The points of intersection with the line representing 100 per cent live stem kill correspond roughly to five pounds of sodium chlorate per gallon for R. inerme and four pounds per gallon for R. lacustre.



Measurements made during the last field season have shown that approximately 630 gallons of spray per acre are required for complete aerial coverage of brush of 100 per cent density, the brush concerned being equal in foliage density and height to R. inerme and R. lacustre under what might be called optimum conditions for growth of these species.

Upon the basis of the figures derived from the curves and the one just given, it is possible to calculate others representing the weights of sodium chlorate that it would be necessary to apply as aqueous sprays to the aerial plant parts to achieve 100 per cent live stem kill of R. inerme and R. lacustre growing on one acre of ground under the specified conditions.

For R. inerme, the figure is roughly 3,100 pounds, for R. lacustre, roughly, 2,500 pounds.

Sceptics, after reading the foregoing, will no doubt feel as Mutt did when he replied to Jeff's assertion that, "Figures don't lie," by saying, "No, but liars will figure"!

NOTES

C. C. Strong and M. C. Riley returned to Spokane April 9 from Ryderwood, Washington, where they had conducted a Ribes survey to determine the feasibility of establishing a white pine nursery by the Long-Bell Lumber Company.

Vol. 7 No. 5

May, 1932

WESTERN BLISTER RUST

NEWS LETTER

* * *

Confidential

* * *

INDEX

U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

NOTES ON BIOLOGICAL CONTROL OF BLISTER RUST

By

L. N. Goodding

Lest we forget or lest some folks think we have deserted the good ship "Biological Control", I wish to discuss some phases of the parasitism of rusts by other fungi, basing most of my discussion on field and laboratory observations on blister rust parasites. We are all familiar with the fact that Hubert has tried or is trying some experiments with Tuberculina maxima, hoping to develop another agent in the control of blister rust. Possibly some think of such an organism as being unique. There are many such organisms however. Some doubtless are among the agencies which tend to balance nature and prevent certain rusts and other fungi from destroying completely their hosts. Arthur, in his book on rusts, names 37 fungi attacking rusts or living in intimate association with them. Many of those are of no economic importance and none as far as I can learn has ever been experimented with for any considerable time to determine its possibilities as a control agent. T. maxima has received more attention than others.

I wish to discuss a few of the agents which have been observed in the West on blister rust cankers.

T. maxima has been found on blister rust cankers in British Columbia and in Europe. It also occurs on some other Cronartia such as C. harknessii. The name "lilac fungus" has been applied to it because of the distinct purple color in the felty fungus which spreads over the surface of the cankers, often completely destroying aecial production. The spores are not quite sphaerical, light violet in color, and 10-15 microns in diameter. The fact that this fungus is already present in the Northwest and that it has not proved of economic importance may not in itself prove that certain strains may not be developed experimentally or introduced from Europe which will become factors in blister rust control. This fungus has not been reported in Oregon.

Dasyscypha Agassizii var. rufipes Phill. occurs on dead and dying wood of several species of trees, and doubtless cannot be classed as a true parasite on either white pine or on blister rust cankers. It, however, occurs in great abundance at times on both blister rust and Atropellis cankers, and seems to result in the early death of both canker and twig in the case of blister rust. While there seems to be little doubt that aecial production is reduced by this fungus as the tree or branch begins to lose vitality, it is entirely innocuous while the tree and cankers are vigorous. This fungus is readily recognized by the bright-colored hairy cups on short stalks. The outside is light orange-yellow, while the inside of the cup is deep reddish-orange. It is a true ascomycete with eight oval or oblong single-celled spores to the ascus. Early in the development of this fungus, small round yellowish bunches of mycelium which produce minute conidia-spores appear on the bark to be followed promptly by the bright colored cups. Many of the Idaho boys are familiar with Dasyscypha fusco-sanguinea, a true parasite of white pines, which closely resembles the one discussed here.

Fusarium sp. In the Rhododendron region blister rust cankers are attacked by a number of fungi besides the Dasyscypha just mentioned. The Fusaria are the conidial stages of Nectrias, but because the conidial stages seem to be the more active and because, in the case of those discussed here, the true connection with the Nectrias has not been made, they will be discussed separately. The Fusarium in question is an active parasite on the aecia of blister rust. The mycelial mass forms a light orange-purple compact covering, leathery when dry, which completely envelopes the aecial mass. At times these masses appear independently. The conidia are produced on the surface. The spores are usually somewhat curved, sharp at both ends, 28-30 microns long by 3.5-5 microns thick in the middle, and 1-4 septate.

If this fungus could be persuaded to do all of the time what it does sometimes on limited areas, it would be the solution to our blister rust problem. It appears, however, to be very limited in its usefulness. Its perfect stage is probably the following:

Nectria sp. The Nectrias are ascomycetes. The perithecia are commonly globular and bright colored. In age, the top of the perithecium in some species collapses, leaving cup-like structures. This one has bright red perithecia scattered singly over the surface of the infected portion. These are very small (about .2 mm. in diameter.) The asci are eight-spored: spores two-celled with a slight constriction at the septum, 17-22 microns long by 5-7 microns thick, distinctly tapering at both ends but not pointed, greenish tinted. Many of the Nectrias are active parasites. This one occurred on blister rust cankers but too little is known of it to suggest its possibilities. It is probably the perfect stage of the Fusarium discussed above.

Fusarium sp. This Fusarium is very distinct from the one already discussed. The spores are much longer (about 50 microns straight across from tip to tip), more slender, and distinctly crescent-shaped. It occurs on blister rust cankers apparently independent of the aecia. It was associated with the following Nectria:

Nectria sp. The perithecia of this are minute, .1-.15 microns in diameter, pink to pale orange, on the specimen examined completely embedded in algae; asci eight-spored, spores 12-14 microns long by 7-8 microns thick, 2-celled. This Nectria and the Fusarium associated were evidently parasitic but apparently both are rare.

Phomopsis? This interesting organism may or may not be a Phomopsis. It lives on blister rust cankers. Whether it is actually parasitic or merely robs the blister rust of its food is immaterial. The fruiting bodies appear as minute pustules about 1 mm. across. As viewed with a hand lens, these are black, but when sectioned and examined with a microscope they are bright green. The pycnidium (body containing the imperfect spores) before erupting through the epidermis of the bark is flat below and rounded above. When it breaks through the surface, it forms a distended cup with the spores protruding. The spores are attached to slender pedicels, often in chains but no more than two

were observed in a chain. The spores are sharp pointed, have no septa, and as soon as they break free become crescent-shaped. They are 30-40 microns long by 3.5 microns thick in the middle. The organism appears to attack cankers of all ages, but mostly the young ones. What it appeared to be doing is probably too good to be true. It seems to have resulted in the death of hundreds of young cankers. The fruiting bodies were found on many of these, but could not be found constantly; hence, they may not be even the most active agent in the good work. Something, however, has cut down aecial production in this particular area on the Sandy Lumber Company holding to a very remarkable degree, and this may be the thing responsible. It will bear watching.

Other fungi have been found on dead or dying blister rust cankers, but those discussed above have excited the interest of the writer.

SIZE AND ORGANIZATION OF CREWS IN RIBES ERADICATION BY HAND PULLING METHODS

By
H. E. Swanson

An analysis of all experimental work conducted on the problem of the relation of crew size to eradication costs and a complete survey of all Ribes eradication by hand pulling methods in northern Idaho during the period 1927 to 1930 illustrate the following:

1. Costs of Ribes eradication increase as the number of men in the crew increases.

2. Ribes efficiency increases slightly as the number of men in the crew increases.

3. The 3-man crew is most satisfactory for general work where it is necessary for the crew to lay its own string line as it covers the area.

4. 1-man and 2-man crews can be used to advantage where it is unnecessary to lay a string line as the crew covers the ground.

5. The crew leader should work in the line with his crew, pulling Ribes.

Table No. 1 shows the compilation of data used for the construction of the curves shown in Chart No. 1. In all cases the size of crew refers to the number of men actually working in the line. If a man were checking behind the crew, his time was disregarded.

Curves have been plotted for each eradication type. The composite curve for each size of crew in all types was constructed by giving equal weight to the curves for each type. In all types the various sizes of crews ranked in the same order as in the composite curves, but in different proportional relations.

TABLE NO. 1

COMPILATION OF RIBES ERADICATION DATA BY SIZE OF CREW FOR ALL TYPES (1927-1930)

Stream

Ribes Class Mid-point	2-Man		3-Man		4-Man		5-Man		6-Man	
	Man Days Per Acre	Total No. Man Days	Man Days Per Acre	Total No. Man Days	Man Days Per Acre	Total No. Man Days	Man Days Per Acre	Total No. Man Days	Man Days Per Acre	Total No. Man Days
10	.13	86	.25	36	.38	36	.23	20	-	-
30	.22	36	.32	48	.44	33	.31	21	-	-
50	.31	16	.32	72	.38	43	.43	31	-	-
70	.23	12	.37	33	.45	60	.55	37	-	-
90	.27	9	.42	74	.48	77	.47	64	.69	26
125	.41	28	.50	208	.60	163	.71	122	.63	56
175	.49	24	.59	174	.62	134	.75	157	1.09	35
250	.66	34	.69	340	.70	387	1.19	248	1.17	68
350	.91	48	.87	283	1.03	218	1.43	170	1.63	62
450	1.08	24	1.03	342	1.15	217	1.54	204	2.31	54
625	1.03	18	1.28	581	1.35	265	2.15	253	2.26	86
875	1.46	5	1.71	279	1.81	190	3.51	118	3.15	80
1,250	2.12	18	2.25	133	2.64	167	3.50	255	4.09	135
1,750	2.56	8	2.77	76	3.58	130	3.08	118	4.35	85
2,500	-	-	3.91	73	4.31	74	4.45	94	5.46	57
3,000+	-	-	6.03	36	6.67	8	6.17	33	10.71	60

Reproduction

Ribes Class Mid-point	3-Man		4-Man		5-Man		6-Man	
	Man Days Per Acre	Total Man Days	Man Days Per Acre	Total Man Days	Man Days Per Acre	Total Man Days	Man Days Per Acre	Total Man Days
10	.06	14	.08	89	.15	52	-	-
30	.16	14	.19	63	.25	30	-	-
50	.21	12	.36	22	.31	3	-	-
70	.26	33	.41	16	.89	8	-	-
90	.42	17	.88	22	.97	5	-	-
125	.68	16	.59	27	.55	20	.81	18
175	.75	14	.49	27	.98	40	1.10	11
250	.78	21	.67	38	.90	52	1.02	9
350	.87	30	1.61	24	.51	25	1.10	9
450	.99	36	1.71	25	1.50	17	1.87	13
625	1.40	26	1.52	51	2.15	18	2.05	14
875	-	-	2.23	42	3.31	23	2.11	8
1,250	2.19	15	3.08	5	3.13	16	4.35	5
1,750	2.75	4	3.32	6	4.35	11	6.00	5
2,500	-	-	-	-	6.25	11	-	-

Data compiled by C. C. Strong, M. C. Riley, H. E. Swanson

TABLE NO. 1 (Con't.)

Ribes Class Mid-point	3-Man Man Days Per Acre	3-Man Total Man Days	4-Man Man Days Per Acre	4-Man Total Man Days	5-Man Man Days Per Acre	5-Man Total Man Days	6-Man Man Days Per Acre	6-Man Total Man Days
Pole								
10	.05	49	.06	86	.13	28	.25	3
30	.22	35	.11	69	.14	10	-	-
50	.14	25	.20	28	.39	6	-	-
70	.16	22	.27	17	.35	12	-	-
90	.20	7	.38	8	-	-	-	-
125	.24	36	.42	33	.97	23	1.32	6
175	.57	35	.34	10	.93	3	-	-
250	.45	32	.54	29	-	-	1.28	10
350	.47	21	1.38	5	1.30	12	-	-
450	.61	15	.50	34	1.22	-	-	-
625	.77	21	.57	39	1.76	12	1.23	5
875	-	-	1.24	16	1.54	5	-	-
1,250	-	-	1.37	5	1.74	5	-	-
1,750	1.16	5	1.76	16	-	-	4.47	5
2,500	-	-	2.00	8	3.25	10	-	-
Mature								
10	.06	95	.08	82	.09	105	.31	19
30	.15	48	.12	80	.20	67	.23	65
50	.13	71	.24	36	.26	77	.26	14
70	.31	55	.29	47	.30	67	.32	26
90	.17	27	.40	20	.35	39	.45	20
125	.31	67	.35	56	.42	35	.74	10
175	.40	39	.58	37	.60	22	.65	13
250	.66	64	.78	61	1.03	19	1.79	10
350	.73	20	.77	26	1.34	13	.65	12
450	.74	22	.75	5	.90	4	.70	6
625	1.10	47	-	-	-	-	2.30	5
875	1.53	32	-	-	-	-	-	-
1,250	2.24	24	-	-	-	-	-	-
1,750	2.27	15	-	-	-	-	-	-
2,500	2.55	10	-	-	-	-	-	-
Cut-Over Mature								
10	-	-	.06	24	.20	4	.29	9
30	.09	5	.15	10	.43	7	.47	9
50	.13	9	.15	10	.33	13	.29	11
70	-	-	.10	5	.35	45	.43	12
90	.21	15	-	-	.60	38	.53	17
125	.30	21	.22	20	.72	64	.55	26
175	-	-	.34	9	.74	102	.92	12
250	.38	23	.51	35	.65	95	.88	56
350	.55	27	.51	35	.73	97	1.05	49
450	.54	7	.77	32	.90	37	1.19	22
625	.85	29	.91	68	1.25	117	1.09	49
875	1.10	22	1.44	18	1.29	52	1.65	14
1,250	1.38	7	1.52	18	1.85	48	1.72	103
1,750	-	-	2.44	11	-	-	2.41	42

CHART NO. 1

PRODUCTIVE EFFICIENCY OF VARIOUS SIZES OF CREWS IN RIBES ERADICATION BY HAND PULLING METHODS

(Data in Table No. 1)

Composite Curves for All Eradication Types

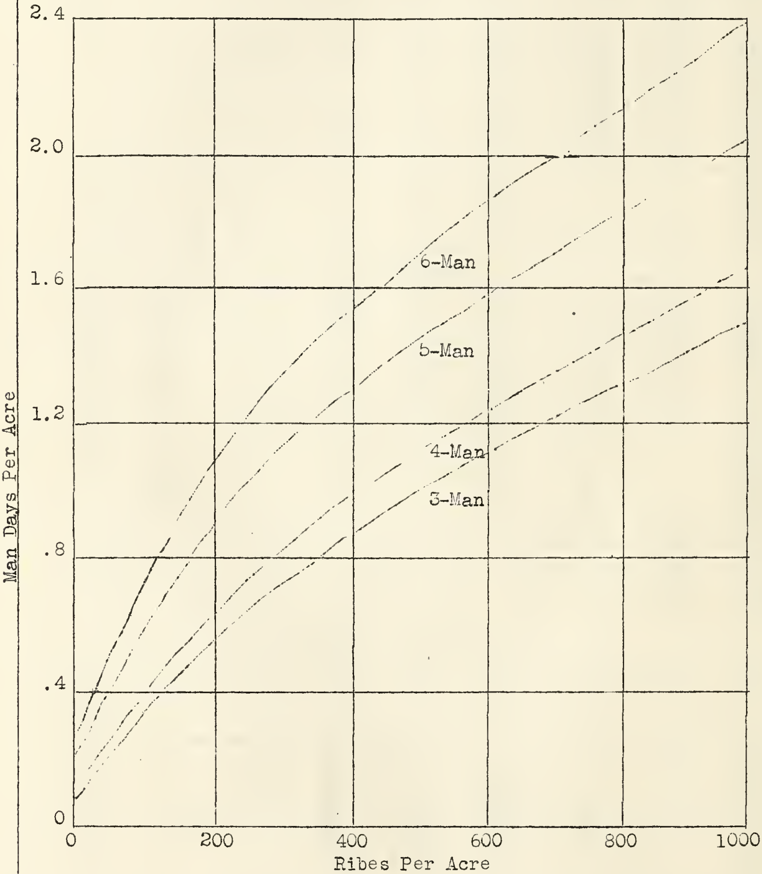
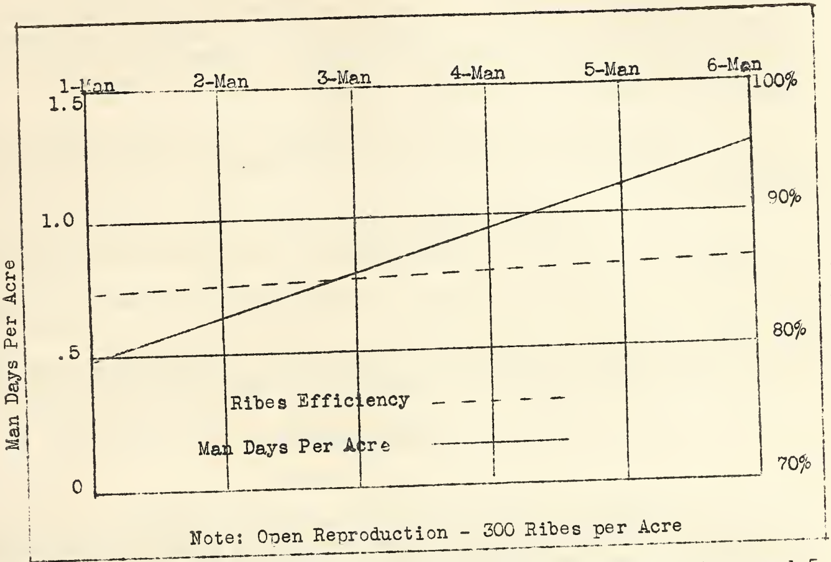


CHART NO. 2
EXPERIMENT ON SIZE OF CREW
(String lines laid in advance for crews)



The greater than proportional increase between the 4-man and 5 man crews than between the 3 and 4-man and the 5 and 6-man crews is difficult to account for. However, in many cases the 5 and 6-man crews had a man checking behind the crew line which method has a tendency to make a crew overcautious and thereby retard its progress.

Further analysis of experimental work illustrates the reduction in costs which the 3-man crew has accomplished.

TABLE NO. 2

TIME ANALYSIS STUDIES
Travel - Pulling - Searching

Ribes Per Acre	Per Cent Travel Time		Per Cent Pulling Time		Per Cent Searching Time	
	1928	1930	1928	1930	1928	1930
30	27	39	6	22	67	49
106	14	20	14	33	72	47
166	14	16	23	37	63	47
480	10	13	28	49	62	38

4-man and 5-man crews used in 1928.
3-man crews used in 1930.

The reduction in searching time and the corresponding increase in pulling time for the 3-man crews illustrate very well the improvement in methods. It must be pointed out that it is impossible to separate what is actual searching time and what is waiting time. In reality, the reduction in searching time is no more than the elimination of unproductive waiting time in the larger crews. The increase in travel time for the 3-man crew is a direct result of the larger acreage covered.

A word might be said on the elimination of a checker behind the crew line. All arguments are in favor of the foreman working in the line, pulling Ribes.

1. The men in a crew work faster when their leader is working with them.
2. A checker behind the crew causes it to be overcautious and retards its progress.
3. The areas can be rechecked at a later date and a higher percentage of the missed bushes found in one-third to one-eighth of the time required by a man checking directly behind the crew.
4. Only a small per cent of the Ribes missed by eradication crews are entirely hidden by brush, while approximately 60 per cent are in the open.

CANKER ANALYSIS

By

H. N. Putnam

A considerable amount of confusion exists in regard to the method of determining the age of a pine infection center by an analysis of cankers. A large part of the responsibility for this deplorable state of affairs must be shouldered by those of us working on the effectiveness of control project. We have been too prone to include a canker analysis in a report and state that on the basis of the table shown infection originated in such and such a year without taking the time or trouble to explain how we arrived at this conclusion. This paper constitutes an effort to describe the canker analysis and show its use. As a matter of routine a canker analysis is made of every pine infection center found. It is absolutely essential in determining the probable year of origin of infection and the year or years of heavy waves of infection. The proper understanding of this means of determining the history of an infection center is therefore important to all of us.

It is well known, of course, that blister rust infects pines through the needles. Normally fifteen to twenty months elapse from the time of needle infection to the time discoloration appears on the wood. A sporidium produced from a teliospore on the Ribes leaf falls on a pine needle. It germinates and presumably the germ tube enters the needle through a stoma. The length of time required for the mycelium from the germinating sporidium to grow from the point of entrance on the needle to the bark cambium is not known. This time element is probably largely controlled by the distance from the point of entrance on the needle to

the base of the needle. It is believed, however, that a negligible number of cankers will result from infection through needles which will fall off within a year from the time of infection. Therefore a white pine holding its needles two years would commonly receive infection only through needles of current growth and one holding needles five years would receive infection only through needles of the last four years.

In considering the age of an infection on eastern white pine the common practice is to take the year of growth at the center of the canker as the probable year of origin of that canker. Eastern white pine usually bears its needles only two or three years. Infections entering on two or three-year-old needles would in the great majority of cases fail to reach the bark cambium before the needles fell. Hence the great majority of cankers found on eastern white pine must necessarily have originated on the current season's needles, in which case the year of growth at the center of the canker would, of course, be the year of origin of that particular canker.

The need for canker analyses in studying infection on Pinus monticola is primarily due to the fact that western white pines commonly bear their needles from three to five years. It is apparent that on a tree holding its needles five years, infection originating in any one year can conceivably enter on needles borne on any growth of the last four years.

A canker analysis, as used in the West, is simply a classification of cankers according to year of growth infected, and stage of canker development. We are indebted to Mr. H. G. Lachmund of the Portland Office, Division of Forest Pathology, for this very useful measure. Cankers normally go through a fairly definite series of recognizable stages in their development. Therefore, by grouping cankers according to stages of development we roughly segregate them into approximately similar age classes. Lachmund has shown that given a sufficient number of cankers in a particular stage of development they tend to arrange themselves in a fairly consistent pattern. This pattern generally takes the following form:

Growth of the season of infection -	10	per cent of the cankers
Growth of one year older - - - - -	50	" " " " "
Growth two years older - - - - - -	30	" " " " "
Growth three years older - - - - -	9	" " " " "
Growth four years older - - - - - -	1	" " " " "

This pattern varies within wide ranges but quite consistently shows the greatest number of cankers on growth one year old at time of exposure. Therefore, for any stage of development, the year of the youngest growth on which cankers were found would be the year of origin of infection when growth one year older bears the greatest percentage of cankers.

It might be well at this point to describe the different stages

of canker development as recognized in making a canker analysis. Each canker is classified according to its most advanced stage.

First symptoms. A "first symptom", as the name indicates, is the first visible evidence of infection on the pine. It consists of a more or less circular area of discoloration up to 3/4" in diameter centering around the needle through which infection entered. Usually no swelling is apparent at this stage.

Juvenile. A "juvenile" canker is one in which the discoloration has covered an area much larger than the "first symptom" stage. It has usually encircled the branch and is one to three inches in length. A swelling is now apparent but no pycnia or aecia have been produced.

Current year's pycnia. A canker in the "current year's pycnia" stage is one producing pycnia for the first time during the season of examination. They make their appearance from July 1 to September 30. When first formed the pycnia appear as a sticky light brown substance having an unpleasant odor. Aecia are usually developed on that portion of the canker which produced pycnia the previous summer.

Previous year's pycnia. Often the canker fails to produce aecia the spring following the production of first pycnia. Instead it forms a second crop of pycnia. On these cankers the pycnia formed the previous year appear as dark brown scars on the canker easily distinguished from the lighter brown pycnia of the current season.

Produced aecia once. Aecia are produced first on the oldest part of the canker near its center on that portion previously bearing pycnia. This stage can be recognized most easily, of course, in the spring when the yellow aecia are present. It can be recognized at other times of the year by the more or less triangular cracks on the canker formed by the aecia bursting through the bark.

Produced aecia twice. The second crop of aecia are borne on that portion of the canker immediately adjacent to and sometimes overlapping the area bearing aecia for the first time. It is usually fairly easy to determine whether a canker has produced aecia once or twice by the character of the aecial cracks at the center of the canker. On a canker producing aecia twice the cracks at the center appear darker and older than those on that portion producing aecia for the second time. However, in the case of cankers producing aecia very sparsely the first time, it is sometimes quite difficult to determine whether these cankers have produced aecia once or twice. It is not usually possible to determine the specific number of times a canker has produced aecia beyond twice, and such cankers are grouped under the heading "produced aecia several times".

Dead. A canker is classified as dead if there is no evidence of discoloration on either end and if the branch is also completely dead not only outward from the canker but also inward toward the trunk.

Whether or not a canker is dead is sometimes difficult to determine. Cankers have been pronounced dead at one inspection and at later inspections shown to be still alive and progressing toward the trunk.

The length of time after infection as represented by these various stages might be interesting. For the sake of simplicity let us take a concrete example: assume that a batch of cankers started from needle infections in August, 1927. The first symptoms of these cankers normally appeared during the fall of 1928 and spring of 1929, 14 to 20 months after needle infection. The juvenile stage was reached in the spring of 1929 to the fall of 1929, 18 months to two years after needle infection. First pycnia appeared in the summer of 1929 and the summer of 1930, two to three years after needle infection. Second pycnia and producing aecia for the first time, identical stages in point of age of canker, appeared in the spring of 1930 and the spring of 1931, two and a half to three and a half years after needle infection. The production of aecia would normally continue annually thereafter until the host was killed, unless the canker was affected by such factors as secondary fungi, physiological conditions, chewing, etc.

We are now ready for an examination of a canker analysis. There is shown following the analysis of cankers found at Newman Lake, Washington in 1929.

Table No. 1

ANALYSIS OF CANKERS, NEWMAN LAKE, WASHINGTON, 1929

Year of Growth Infected	First Symptoms	Juvenile	Current Year's Pycnia	Previous Year's Pycnia	Produced Aecia			Dead	Total
					Once	Twice	Several Times		
1927	16	8	1						25
1926	190	99	3		1				293
1925	98	47	4						149
1924	35	25	4	1	1	1			67
1923	4	2	1		1		2	1	11
1922						1	8	2	11
1921							3	4	7
1920								1	1
1919									
1918							1		1
Total	343	181	13	1	3	2	14	8	565

Note in the table that the great majority of cankers were found in the first two columns of "first symptoms" and "juvenile". Note further that the largest number of cankers in these two columns was found on 1926 wood with a small number found on 1927 wood. Consider now the column headed "produced aecia several times". In this column there were two cankers found on 1922, three on 1921 and one on 1918 wood. Although there are only a few cankers in this column the general pattern resembles that in the "first symptoms" and "juvenile" columns. The few scattered cankers in the

"produced aecia once" and "produced aecia twice" columns are very probably those few cankers more developed than the great majority of the same age. The interpretation of the canker analysis shown in the table is that infection originated in 1923 with a few cankers and that as the result of these few cankers producing a large volume of aecia in 1927 a heavy wave of infection occurred in that year.

Canker analyses have been made at Newman Lake in 1929, 1930 and 1931. In Table No. 2 there is shown the distribution of cankers found in each of these three years, classified according to year of growth infected.

TABLE NO. 2

DISTRIBUTION OF CANKERS BY YEARS OF GROWTH INFECTED, NEWMAN LAKE, WASHINGTON

Year Tally Made	Total Number of Cankers	Per Cent of Cankers by Year Growth Infected										
		1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	Total
1929	565	0.0	4.4	51.9	26.4	11.9	1.9	1.9	1.2	0.2	0.0	0.2	100.0
1930	1,591	0.4	15.2	53.7	22.6	5.7	0.9	0.9	0.4	0.1	0.0	0.1	100.0
1931	1,935	1.5	17.9	51.2	21.8	5.4	0.8	0.8	0.4	0.1	0.0	0.1	100.0

In 1930 there were nearly three times and in 1931 three and a half times the number of cankers found in 1929. In spite of this increased number of cankers the largest proportion was found on 1926 wood at each of the three inspections. In 1930 a small number of cankers were found on 1928 wood, and in 1931 a somewhat larger number. In neither case was the proportion large. It is obvious that the great majority of cankers found in 1929, 1930 and 1931 were of 1927 origin with a much smaller number of 1928 origin. If a large number of cankers of 1928 origin had been present we would have expected the number of cankers found on 1927 wood to have greatly increased in 1930 and 1931. The development of cankers as shown in the canker tallies of 1929, 1930 and 1931 is shown in Table No. 3.

TABLE NO. 3

DISTRIBUTION OF CANKERS BY DEVELOPMENT STAGES, NEWMAN LAKE, WASHINGTON.

Year Tally Made	Total Number Cankers	Per Cent of Cankers by Development Stages								
		First Symptoms	Juvenile	Current Year's Pycnia	Previous Year's Pycnia	Produced Aecia: Once	Produced Aecia: Twice	Produced Aecia: Several Times	Dead	Total
1929	565	60.7	32.0	2.5	0.0	0.5	0.4	2.5	1.4	100.0
1930	1,591	1.6	51.4	23.3	0.6	17.0	0.2	0.4	5.5	100.0
1931	1,935	0.0	3.7	5.6	13.8	46.3	6.5	0.4	23.7	100.0

This table illustrates very well that there is a normal development of cankers from one stage to another. In 1929 the majority of cankers were "first symptoms", in 1930 "juveniles", and in 1931 "produced aecia once". Note in Table No. 3 that in 1930 very few "first symptoms" were found

and in 1931 no "first symptoms" with very few "juveniles". This is essentially a 1927 wave of infection. If there had been present an appreciable number of cankers originating in 1928 we would expect to see them showing up in large numbers as "first symptoms" in the 1930 inspection to correspond with the large number of "first symptoms" of 1927 origin found in the 1929 examination. Note the rapid increase in the number of dead cankers of 1927 origin. Nearly one-fourth of all cankers found were dead in the 1931 examination.

In this paper I have tried to bring out that a canker analysis is an essential measure in determining the history of an infection. It is necessitated by the fact that _P. monticola_ bears its needles three to five years. The canker analysis consists in the classification of cankers according to the year of growth infected and the stage of canker development. Lachmund's rule of arrangement in determining the probable year of origin of a group of cankers is that in a given stage of development the cankers will arrange themselves in such order that the probable year of origin of the group is the year following that year on whose wood the majority of cankers occur. It is hoped that this labored explanation may interest all of us in joining the happy throng of canker analyzers.

THE POSSIBILITIES OF AERIAL PHOTOGRAPHY ON BLISTER RUST CONTROL

By
L. L. White

After having had the topic of aerial photography brought to our attention time and again during the past winter, we ask the question, "Is it feasible to use aerial photography in conjunction with blister rust control work?" After some investigations and consultations, our answer to the question is, "Yes, it is both feasible and practicable and also of great value." We believe that in the future aerial photography will play a big part in obtaining field information of real worth to this office, and will do so at a saving of money and time.

There are two types of pictures taken from the air, the oblique and the vertical. The oblique, which is merely a shot across country generally taken from an elevation of about 10,000 feet, is in most cases taken up or down a single drainage. These pictures have been known to show a horizontal distance of twenty-five miles. In this office, we have used oblique pictures very little as yet. Recently, Miller Cowling obtained a group of pictures taken up the side drainages of the St. Joe River above Avery, Idaho, and the information taken from them is being used in establishing blister rust control camps in those areas during the coming summer. The only information available from oblique pictures is that actually visible on the picture, and we found that only the portion of the drainage showing the two or three miles

closest on the photograph (or to the camera) was distinct and detailed enough to be of real value.

The vertical picture is taken from an elevation of from 15,000 to 20,000 feet. The pictures are taken in strips through a hole in the bottom of the plane, each picture overlapping the other about 60 per cent. In making the strips the plane flies back and forth over the area, each strip also overlapping to some extent. The approximate width of country shown on the strip is one mile. From this set of pictures a complete and accurate topographic map can be compiled by using a method called the Radial Photographic Mapping Method. With the aid of a stereoscope, the pictures are of great value also in studying wooded areas as actually seen from the air. The only complete set of vertical pictures that we have at the present time is that of the Fishhook Creek drainage in the St. Joe National Forest, taken during the early part of the summer of 1931 by Miller Cowling. Incidentally, the process of laying out these pictures and compiling a drainage map from them is the only experience along these lines that we here in the office have had the opportunity to obtain. In assembling these verticals a method was used which we found to be quite inaccurate and which has been replaced by the Radial Method. On checking the photographic map with the U. S. Land Office map we found that an unaccountable error had been introduced into the center portion of the map. As a result the head of Fishhook Creek was situated about one mile east of its actual location. However, by placing them under the stereoscope some very valuable information was obtained from the set of pictures pertaining to timber types, topography, estimation of general Ribes conditions and locations of draws, roads, trails, etc.

Timber types can be determined quite accurately from vertical pictures. Areas as small as five acres of mature, pole and reproduction types can be identified. A good idea of the density can be obtained also. Burns, and rocky and grassy slopes can be readily determined. These items are of great value in preeradication survey estimations. From the knowledge obtained from check plots and an aerial view of the area, Ribes sites can be very readily picked out. We know that openings and young timber types are Ribes sites, and these areas can be transferred to the map to be used in preeradication survey ground work which can then be confined mostly to these areas. Rocky and grassy slopes can be readily located, and recognized in making plans for eradication operations. Another valuable aid to ground work is the fact that the character of the stream type can be seen from these pictures.

In a general way this information can be procured from oblique pictures but not in the detail or with as much accuracy as can be had from the verticals. Also, since the general direction of the picture is on a horizontal plane practically no view of the stream type can be secured because it is impossible to look directly down into the stream bottoms.

A very important use of aerial photographs is in estimating timber values by determining the vegetative cover. In many cases it is very difficult

to determine from existing type maps whether or not a forest supports a good crop of forest trees. This point is important in blister rust control operations because poor stands of white pine (if the causes for poor stands are factors such as topography, exposure, soil, etc., which show readily on aerial photographs) will not justify the cost of blister rust control under average prevailing conditions. Only the most complete data obtained by systematic strip cruises can give information comparable to that secured from the aerial photograph. Even the actual picture is so far superior to studying figures that there really is no comparison of results. Hence, in selecting areas for instituting blister rust control, much unnecessary ground work can be eliminated by the use of aerial photography. Both the verticals and obliques can be used in obtaining this information.

There is nothing that gives a better view of the topography of an area than does the vertical photograph viewed under a stereoscope. All ridges, stream bottoms, waterfalls, rock cliffs and draws are pictured as if actually seen from the air, but in greater detail due to the powerful lens of the camera. This information is useful in determining the accessibility of an area in which there are no roads or trails.

The oblique pictures are not of great value in determining minute topographic features as they cannot be viewed under a stereoscope and there is not nearly the amount of detail in them that there is in the vertical pictures. However, these pictures are very useful in getting an idea of the topography of the area as a whole, and in viewing the course of the drainage photographed.

The location of camps is greatly aided by both types of photographs. The whole area to be worked can be viewed at a glance, which assists in locating camps according to the portion of area to be worked. All roads and trails are visible and this gives us an idea as to the accessibility of any certain point or location.

These pictures, both vertical and oblique, are of great value to the camp boss. From them he gets an excellent conception of just how his area lies, and he knows the direction and location of every ridge and drainage. He is able to locate even the smallest draw and with this knowledge can direct the work of his crews to a greater advantage. He can save considerable time in checking and can obtain a more efficient check. On areas where stream type only is being worked, with the above information on hand there is very little danger of any areas ever being missed. The information is a great aid also both to the camp boss and crew forman in drawing maps of the areas worked.

We had hoped that from aerial photographs taken from a low elevation we would be able to determine the tree species, but pictures taken with this end in view show that the species cannot be determined. Alpine timber

can be distinguished from lowland timber but that is the extent of the difference recognizable along that line.

Aerial photographs can be used as a means of determining the possible progress or spread of the rust on an area. Stream junctions, pockets and ridges have an important bearing on the action of the rust. Stream flow sometimes determines the density of Ribes thickets, and wind currents influence the spread of spores. The area can be seen at a glance from the actual photograph, and from these photographs it might be possible to make a prediction on these two points, and thus we would be enabled to more effectively place a control operation on a given area.

We have used both the vertical and oblique type of picture and find that a great deal more information can be obtained from the vertical pictures. However, the oblique pictures are very much more economical because less time is required for the taking of the pictures and because of the saving in films and time in developing and printing. Therefore, considering the value of the information and the cost of both types of pictures, which type would we be justified in using? We suggest that on areas which will require more than one day for photographing vertically, the oblique pictures be taken, and on areas that can be photographed vertically in one day, the vertical photographs be taken.

Thus we can see that aerial photography would lead to a great saving in money and time. The pictures can be used during the entire control operation from the preeradication survey to the actual eradication of Ribes on an area. We believe also that with the aid of these pictures we can get a higher efficiency in our work and we hope that in the near future we shall be able to establish aerial photography in blister rust control work on a firm and substantial basis.

80,000 SEE BLISTER RUST EXHIBIT

The story of white pine blister rust was presented to the public in an entirely new form at the annual Sportsmen's Fair at Spokane May 9 to 15, which was attended by more than 80,000 persons.

Two miniature forests, together with mounted specimens, pictures and lantern slides were used to tell the story of blister rust, its damaging power to pines, and its control. One forest had Ribes in it and was composed of dead, partly dead, and healthy trees while the other forest was free of Ribes and had only healthy trees. Plastic wood was used to make cankers on the dead and partly dead trees; these were painted and very good imitation cankers resulted. Suitable signs were used to explain the entire situation.

In addition to the two forests, the automatic slide projector was used with a complete set of slides and legends and two of the large demonstration cases with colored pictures and preserved specimens

completed the show. Bulletins were given to all persons desiring them.

Our space this year was adjacent to the Forest Service display which consisted of a fully equipped lookout station with a man on duty at all times.

Five truck loads of dirt, one truck load of rocks, one truck load of white pines and about 20 gooseberry bushes were used in building the exhibit.

ERRATA

H. N. Putnam

In the April, 1932 issue of the Western News Letter, page 40, paragraph 3, line 6, read: ".04 R. lacustre leaves 100 per cent infected" instead of "1.04 R. lacustre leaves * *".

At top of page 40, line 1, read "24%" instead of "9%".

As evidence of carelessness on the part of the writer, this is an open challenge.

ALL IN A DAY'S WORK?

"April 18 - Left Corvallis, Oregon 3 P.M., arrived mudhole 10 miles from Gunter, Oregon 10 P.M.

"April 19 - (Lodging 4/18 - no charge - worth much less). Left said mudhole at 5:30 A.M., arrived Cottage Grove, Oregon 8 P.M.

"An attempt was made to go to Gunter with Hansbrough and Mielke to inspect the chestnuts, study Ribes phenology". (Goodding's April, 1932 expense account.)

NOTES

C. C. Strong, Homer Hartman and B. A. Anderson returned May 17 from a one-day trip to Clarkia, Idaho, where they located plots for early season spraying on Ribes inerme. They report that the 1931 chemical work on R. petiolare on the St. Maries River shows almost a perfect kill. A stop was made at St. Maries, Idaho, where arrangements were made with the Forest Service for pack stock for the Clarkia job this summer.

* * *

H. E. Swanson and C. C. Strong inspected the chemical experimental plots near Blewett Pass May 13 and 14. Rene d'Urbal and George Draper checked the plots May 10-14.

* * *

H. N. Putnam, E. L. Joy, C. R. Stillinger and C. M. Chapman made a trip to Haugan, Montana, May 10-12 to determine Ribes conditions around Savenac Nursery and to scout for blister rust.

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

RESULTS OF RECONNAISSANCE AND PREERADICATION SURVEYS ON MOUNT RAINIER NATIONAL PARK

M. C. Riley

At a conference held at Mount Rainier National Park in June, 1931, attended by representatives of the National Park Service and the divisions of Forest Pathology and Blister Rust Control, it was decided that a Ribes and white pine survey of the park was immediately needed in order to formulate a comprehensive plan of blister rust control. As was mentioned by Painter in the October issue of the News Letter, the total area examined was 85,000 acres.

The following table lists the white pine areas on Mount Rainier National Park as determined by the survey and the estimated cost of first eradication based upon preeradication surveys conducted during 1930 and 1931.

ESTIMATED COST FIRST ERADICATION, MOUNT RAINIER NATIONAL PARK

Area	Acres			Estimated Cost	
	White Bark Pine	Western White Pine	Total	First Erad.	Per White Pine
Bear Park	300	-	300	$ 1,800	$ .35
Burnt Park	375	-	375	720	.07
Clover Lake	2,840	-	2,840	14,500	.18
Cold Basin	-	550	550	14,800	6.73
Crystal Mt.	1,120	1,300	2,420	19,950	.14
Eagle Cliff	-	13	13	-	*
Emerald Ridge	-	900	900	7,065	.25
Eunice Lake	-	100	100	-	*
Governor's Ridge	225	-	225	700	.15
Grand Park	40	-	40	-	*
Lake James	40	-	40	-	*
Longmire-Silver Forest	-	830	830	-	**
Mowich River	-	110	110	2,900	.88
Muddy Fork Cowlitz	-	1,750	1,750	8,200	.17
Ohanapecosh	-	460	460	-	*
Rampart Ridge	-	1,025	1,025	4,850	.22
Seattle Park	125	-	125	200	.03
Seymour Peak	1,096	-	1,096	5,432	.41
Starbo Camp	-	420	420	1,800	.42
Summerland	300	-	300	1,100	.08
Typsoo Lake	520	-	520	3,060	.22
Vernal Park	50	-	50	-	*
Sunrise Park	1,260	1,140	2,400	-	**
Total	8,291	8,598	16,889	$87,077	

*No cost estimates were made for these areas because of small acreage or exceedingly high cost due to heavy Ribes concentrations or inaccessibility of the areas.

**No tree count has ever been made on these areas. First eradication already performed.

This table was taken from a report submitted to the National Park Service during the past winter. An innovation was made in these estimates in determining the cost per white pine tree for initial Ribes eradication and was included in the hope that it might assist the National Park Service in determining the value of blister rust control work on the several areas. The number of trees was based only upon strip surveys, and the figure is at best approximate. In the report it was pointed out that in contrast to this cost of protection per tree there might be set up the cost of replacing it by planting with some forest species suited to the area and not subject to loss by blister rust. It is believed that the replacement cost in practically every case would exceed the protection cost.

The appropriation available for blister rust control work on Mount Rainier will be expended on the Muddy Fork of the Cowlitz and the Starbo Camp areas.

IMPRESSIONS OF BLISTER RUST IN INTERIOR BRITISH COLUMBIA

Elers Koch
Assistant Regional Forester,
Forest Service

I have just returned from a trip with several other foresters and blister rust men through the country around Nelson and Revelstoke, which has been infected with blister rust for some years. The first infection is believed to have occurred in 1919. If anyone has any doubt about the blister rust being a serious threat to white pine he should take this trip, and the most sceptical would be convinced.

We drove for nearly three hundred miles through the white pine region north of Nelson along the main valleys and lateral roads in the Slocan, Columbia, and Eagle River valleys. At frequent intervals we stopped to look at the stand, and in no single case did we fail to find serious infection on the white pine. The valleys around Revelstoke contain some splendid stands of 20 to 40-year-old white pine, thrifty and fast-growing. The infection is so general here that one can expect nothing else than practically complete destruction in comparatively few years. Cankers are very common on small trees on the main trunk just above the ground line, which means inevitable death for the tree within a short time.

The first infection in this region dates from 1919. The first infection known in Idaho occurred in 1923. Whether four years more will result in such widespread infection in Idaho is of course uncertain, but a definite possibility. The cultivated black currant has, to be sure, been eradicated from Idaho, and this species has been a potent factor of spread in British Columbia. We saw one observation plot on the Columbia River about 10 miles above Revelstoke. This plot is 6 miles from the nearest black currant plantations, and all infection is

assumed to have come from Ribes lacustre. About one-third of the trees on this plot show infection.

The infection seems to be much the heaviest along the main valleys, but we drove up the Revelstoke Park road to 3,800 feet, near the upper limit of white pine, and while the infection on these upper slopes was much lighter, it was still found.

From what was seen on this trip my guess is that only very prompt action will prevent most serious and irreparable damage to white pine in Idaho and western Montana. I believe that with present appropriations of around $225,000 a year for protection of the national forests we may be able to keep ahead of the disease and save most of our best stands. It is probable that the disease will progress so rapidly that much pine will be lost on private land before adequate control action is taken.

Trees are not rapidly killed by the disease. In fact, we saw few actually dead trees, and most of these were under 6 feet high. I doubt if any considerable amount of merchantable timber will ever be lost through blister rust, since a period of many years is available after infection for salvage. In young stands the situation is entirely different. Apparently the infection spreads so rapidly that after it has first appeared there is only a very limited time before such a large per cent of the trees are infected that control measures through Ribes eradication would be too late. Ribes eradication at any time would prevent further infection, but after a stand is at all heavily infected the cankers will spread to the trunk and eventually cause death of the trees. It would appear that our job on the national forests in Idaho and western Montana is to push control work sufficiently rapidly to keep ahead of the progress of the disease, concentrating particularly on the more valuable young stands. After the disease has appeared in any drainage, the available time before control operations will be too late is apparently very limited, probably only a few years.

YEARLY PROGRESS OF BLISTER RUST AND THE DEVELOPMENT OF CONTROL WORK IN THE WEST

M. C. Riley

A good bird's-eye view of the spread of blister rust in the West and the expansion of the measures which have been taken to combat the disease is presented in the following tabular statement which was originally used as a part of the introduction of the 1931 Annual Report on Blister Rust in the Far West. It shows the yearly relation between the rate and spread of the rust over the Northwestern United States and the development of the western control program.

Yearly Progress

Year	The Rust	The Work
1922	Found in Puget Sound region of Washington and interior of British Columbia	Largely confined to scouting for the disease, cultivated black currant eradication in western Washington and quarantine inspection. A very small experimental Ribes eradication operation carried on at Elk River, Idaho.
1923	General spread of the rust over dry belt of B.C. and into north central Washington. First Ribes infection found at Nelson, B. C.	Extension of cultivated black currant eradication program to Montana, Idaho, Oregon, and California. Small experimental Ribes eradication project on Priest River Experiment Station. Beginning of reconnaissance.
1924	Practically no spread of the rust.	Satisfactory development of cultivated black currant eradication program. Larger experimental Ribes eradication project in Upper Priest River Valley. Reconnaissance applied over north end of Kaniksu National Forest.
1925	Extension of rust into north-western Oregon Ribes infection found over area 20 miles in extent, east and west in the general vicinity of Nelson, B. C.	Completion of cultivated black currant eradication in Oregon. Satisfactory progress in other states. Reconnaissance extended to the Coeur d'Alene National Forest and to lands of private timber owners of north Idaho. Further experimental Ribes eradication in Upper Priest River Valley and new project on Crater National Forest, Oregon.
1926	Development of pine infection on Olympic Peninsula and in vicinity of Nelson, B.C. No further spread of Ribes infection.	Completion of cultivated black currant eradication in Montana. Special development of reconnaissance methods, resulting in much more rapid work. Experimental Ribes eradication in West Branch region of Kaniksu National Forest results in material lowering of costs, by developing of scouting methods. Experimental work shows feasibility of chemical eradication. Experimental Ribes eradication started in California. Clearer conception gained of ecology project. Quarantine 63 put into effect.
1927	Further development of pine infection on Olympic Peninsula and new infections found in Puget Sound region. Ribes in-fection gener-	Completion of cultivated black currant eradication in Idaho and Washington. Control reconnaissance placed on a practical basis in Idaho and California. Experimental Ribes eradication conducted on the Coeur d'Alene National Forest in Idaho and the Stanislaus National Forest in California with results indicating feasibility of application of local control. Considerable progress made with experiments in chemical eradication. Development of power

Year	The Rust	The Work
1927 cont.	ally prevalent in Washington west of the Cascades, scattered in eastern Washington. 1st Ribes infection found in north Idaho.	equipment begun for application of chemicals. Ribes ecology project initiated an enlarged program of studies and controlled plots. Quarantine regulations maintained.
1928	New pine infections located in northeastern Washington and in the Mt. Hood region in northwestern Oregon. Ribes infection generally distributed over the white pine region of north Idaho, extended east of the Cascades in Washington, farther south in Oregon and into western Montana.	Cultivated black currant eradication continued in California. Control reconnaissance conducted on national forests and private lands in Montana, Idaho and California. Experimental hand eradication of Ribes carried forward on the Coeur d'Alene National Forest in Idaho, Mt. Hood National Forest in Oregon, and Stanislaus National Forest, California. A protective zone was established around Wind River Forest Nursery in Washington. Application of cooperative local control initiated on Priest Lake Timber Protective Association in north Idaho. Studies of methods of hand pulling and chemical eradication of Ribes resulted in materially lowering of costs by increasing efficiency and speeding up work. Reeradication studies conducted on areas in Idaho originally worked in 1926. Chemical eradication of Ribes consisted of laboratory and field experiments with spray formulae, methods of application and type of spraying equipment. Ribes ecology studies in Idaho were continued and new studies of soil temperature and soil moisture were established. Ribes ecological studies initiated in California. Preeradication survey conducted on Plumas National Forest in California and on stream type in Musselshell district of Clearwater National Forest in Idaho. Quarantine regulations maintained.
1929	Three pine infection centers located near the southern end of white pine region in Idaho, four new centers located on Mt. Hood National Forest,	Cultivated black currant eradication continued in California. Control reconnaissance performed on Lassen National Forest, California. Experimental hand eradication conducted at the Savenac Nursery at Haugan, Montana; on the Plumas National Forest in California; and the Peavy Arboretum in Oregon. Experimental chemical eradication by power spraying conducted on the Clearwater National Forest in Idaho. Cooperative local control extended to the Clearwater and Potlatch timber protective associations in Idaho. A field study of methods of chemical eradication

Year	The Rust	The Work
1929 cont.	Oregon. New Ribes infection located in northwestern Montana, and extension of infections in Oregon including one in southwestern Oregon.	carried on in California during winter resulted in more efficient equipment, development of knapsack spraying methods and training permanent personnel. Chemical reeradication performed in Idaho and hand reeradication on the Coeur d'Alene National Forest in Idaho and Wind River Nursery in Washington. Tests of Ribicides were made at various locations in Idaho, Oregon and California and laboratory investigations were instituted at Berkeley, California. Experimental application of Ribicides at Clarkia, Idaho, tested effectiveness of sprays and seasonal toxicity. Ribes ecology studies conducted in Idaho, Oregon, and California furnished additional findings of value. Plot studies to observe effectiveness of control were initiated at Newman Lake and Long Meadow Creek in Idaho and at Rhododendron, Oregon. Preeradication surveys were conducted on the Clearwater National Forest and Clearwater and Potlatch timber protective associations in Idaho, and the Plumas National Forest in California.
1930	Eleven new pine infections located in the southern portion of the Idaho white pine region and two located in Oregon, these latter marking a continued southern spread. New Ribes infections located in Montana and Oregon indicated further spread; locations in Idaho in region generally infected.	Cultivated black currant eradication completed in California. Control reconnaissance conducted on Eldorado National Forest, California. Experimental Ribes eradication carried on at the Wind River Nursery in Washington and on the Mt. Hood National Forest in Oregon. Cooperative local control conducted near Flathead Lake in Montana, on the Clearwater and Potlatch timber protective associations and the Clearwater National Forest in Idaho and Mt. Rainier National Park in Washington. Reeradication carried on at the Savenac Nursery in Montana and on the Stanislaus National Forest in California. A study comparing knapsack and power spraying in Idaho gave results favoring the knapsack. Investigations initiated to develop chemicals toxic to barberry. Development and testing of Ribicides continued in the laboratory, greenhouse and field, giving definite results valuable to the control program. Ribes ecology studies continued in Idaho gave further results including Ribes seed germination data. Ecological studies in California furnished further information on Ribes establishment, growth and fruiting habits. Studies on effectiveness of control carried on at Newman Lake and Pysht in Washington and Cheekye, British Columbia. Preeradication surveys conducted in anticipation of future control work.

Year	The Rust	The Work
1931	Forty-five new pine infection centers located in Idaho, two in Washington and one in Oregon, none of which marked any spread to new regions. Ribes infections found in Washington and Oregon indicated no further extension of the rust.	Control reconnaissance conducted on Mount Rainier National Park, Washington, on federal and private lands in Oregon, and on the Klamath National Forest in California. Experimental Ribes eradication carried on at the Wind River Nursery in Washington and on the Lassen National Forest in California. Cooperative local control conducted on the Clearwater, Potlatch and Priest Lake timber protective associations, the Upper St. Maries River and the Clearwater National Forest in Idaho, Mount Rainier National Park in Washington and Mt. Hood National Forest in Oregon. Efficiency of Ribes eradication work checked on the Clearwater and Potlatch timber protective associations and the Clearwater National Forest. Studies continued regarding hand and chemical eradication methods, experimental and field equipment, and brush elimination as a means of permanent Ribes suppression. Definite results obtained in development of chemicals toxic to barberry. Control program further benefited by development and testing of Ribicides. Ecological studies conducted in Idaho and California included establishing new studies and obtaining further results from old studies. Pine infections studied on five areas in Idaho and one in Washington. Preeradication surveys conducted in advance of contemplated control work.

FIND NEW PINE INFECTION

L. N. Goodding

Many of the readers of the News Letter have doubtless had in mind that blister rust is common at Government Camp, above Rhododendron, Oregon. It is true very meager scouting has been done there, but no rust has been found to my knowledge prior to this season.

On June 10 I found two incipient cankers on pines, one on Pinus monticola and one on P. albicaulis, both right at Government Camp.

The early uredinial infection at Rhododendron is the heaviest I have ever seen.

1932 FIELD WORK STARTS IN THREE STATES

Ribes eradication and control reconnaissance activities in Washington, Idaho and California during the 1932 field season will employ approximately 1,088 men concentrated in 45 camps. This includes men employed by the Forest Service and the Division of Blister Rust Control. Establishment of the camps started on June 5 and was completed June 17 in all localities

except Mount Rainier National Park; the two camps there will be put in about July 1 if weather conditions permit.

The Clearwater National Forest job is utilizing the largest number of men with 20 camps of 25 men each and one methods camp of 10 men. The camps were established from June 5 to June 15 and the men reported for work from June 15 on. The St. Joe National Forest is the next largest organization with 13 camps of 25 men. These camps went in from June 6 to June 15 with the men reporting between June 12 and June 18. The Clearwater Timber Protective Association is using four 25-man camps and the Clarkia operation has one camp. These five camps were put in from June 13 to 17 with the men reporting for duty June 16 to 20. Three 25-man camps were established on the Priest Lake Timber Protective Association from June 10 to 15 with the men reporting June 15 to 20.

M. C. Riley has a small crew reworking the Longmire Springs area on Mount Rainier National Park and the crew will be kept at that work until about July 1. G. R. Van Atta and four assistants are doing chemical experimental work near Blewett Pass on the Wenatchee National Forest.

The only eradicative work being conducted in California this season is the reworking of the Dorrington area where original Ribes eradication work was performed in 1928. The Dorrington unit is located in the northern part of the Stanislaus National Forest.

D. R. Miller, Frank Patty and Roy Blomstrom compose the control reconnaissance crew which is completing the reconnaissance of the Stanislaus National Forest.

Tom Harris is spending all of his time and W. V. Benedict as much of his time as his other duties will permit, assisting B. O. Hughes of Region 5 of the Forest Service in the compilation of a cooperative inventory and evaluation of sugar pine resources. This work consists of the gathering together and the proper compilation of all existing information with some field work to furnish data not now available.

In addition to the men being used on the eradication and reconnaissance work, there will be a large number employed on checking and scouting crews with a few doing ecology work and conducting damage to pine studies. At the present time E. L. Joy has his checking crews working the East River area on the Priest Lake Timber Protective Association where Ribes eradication was performed in 1931. That area is being used as a training field for the checkers and when the work there is finished the men will be assigned to work on the various areas where Ribes eradication work is being done this season.

The bulldozer brush remover is being operated on the Middle Fork of the St. Maries River between Clarkia and Gold Center, Idaho, with C. H. Johnson in charge of the work. The remainder of the crew consists of the operator of the bulldozer and two assistants. This work started June 20.

The men in charge of the various operations, the unit supervisors, the camp bosses and the location of the camps is shown in the following tabulation:

Clearwater National Forest
Paul Gerrard, F.S. and H. E. Swanson, B.R.C., in charge of operation

Musselshell District: Frank Walters, Supervisor

Camp No.	Camp Boss	Location
1.	Lee Hunt	Lower Eldorado Creek.
2.	Henry Miller	Junction of Eldorado and Cedar creeks.
3.	Les Loch	Bradford's Cabin on Lolo Creek.
4.	Jim Thaanum	Mouth of Six Bit Creek on Upper Eldorado Creek.
5.	Blaine Snyder	On Lolo Creek near mouth of Siberia Creek.
6.	Adrian Purcell	Upper Siberia Creek.
7.	Robert Wood	Upper Musselshell Creek.

Orofino, Orogrande and Weitas creeks district; Neal Nelson, Supervisor

8.	Horace Cupp	Upper Orofino Creek.
9.	Virgil Evans	Upper French Creek.
10.	Dave Hickman	On Weitas Creek one mile south of Weitas Station.
11.	Clyde Smith	Junction of Cabin Creek and Weitas Creek.
12.	James Black	Upper Pine Creek.
13.	H. F. Furrow	On ridge between Bighorn and Orogrande creeks.
14.	Harry Faulkner (Supervisor Camp 14)	Two miles north of Elk Mountain on Lower Washington Creek.

Canyon District; F. J. Heinrich, Supervisor.

15.	William Rideout	On the North Fork of Clearwater River at mouth of Rock Creek.
16.	Kenneth Parks	Upper Rock Creek.
17.	Eric Anderson	Upper Grizzly Creek.
18.	George Meyer	Junction of Grizzly Creek and Quartz Creek.
19.	Charles MacDonald	Bald Knob Lookout.
20.	Not yet selected	Junction of Skull Creek and North Fork of Clearwater River.

Methods Camp
H. E. Swanson, in charge of operation

R. L. Wolcott	Five miles out of Bungalow Ranger Station on Orogrande Creek.

Priest Lake Timber Protective Association
Homer Hartman, in charge of operation

On the Priest Lake Timber Protective Association, Donald J. Moore is in charge of Camp No. 1, Leonard H. Moore in charge of Camp No. 2 and Roland Schaar is in charge of Camp No. 3. The camps are located as follows: One camp 1½ miles up Trapper Creek; one camp 4½ miles up Trapper Creek and one camp on the West Fork of Caribou Creek.

Clearwater Timber Protective Association
B. A. Anderson, in charge of operation

On the Clearwater Timber Protective Association, Fred Crosetto is in charge of Camp W, Arthur Bode in charge of Camp X, William Schakohl in charge of Camp Y and Phil Reinmuth in charge of Camp Z. These camps are located as follows: One camp on Trail Creek three miles out of Pierce, one on Loop Creek west of Headquarters and two camps on Alder Creek.

Clarkia Operation
B. A. Anderson, in charge of operation

On the Clarkia operation, there is one camp located on the St. Maries River above Clarkia. Sidney McLaughlin is the camp boss.

St. Joe National Forest
Neil Fullerton, Forest Service, and
W. G. Guernsey, Blister Rust Control
in charge of operation

Loop Creek, Unit 1, Virgil Moss, Unit Supervisor.

Camp No.	Camp Boss	Location
1.	Roy Lundberg	Ward's Peak District, mouth of Ward Creek.
2.	R. E. Ekberg	Avery District, mouth of Turkey Creek.
3.	Albert Pence	Avery District, mouth of Clear Creek.

Little North Fork, Unit 2, Don Williams, Unit Supervisor

4.	Art Aldridge	Avery District, mouth of Lucky Swede Creek.
5.	L. Franz	Avery District, mouth of Bullion Creek.
6.	Roger Thaanum	Avery District, mouth of Ramsey Creek.
7.	Peter Pence	Avery District, mouth of Railroad Creek.

Slate Creek, Unit 3, Rudolph Anderson, Unit Supervisor

8.	Rudolph Anderson	Avery District, Slate Creek.
9.	Harry Dunnegan	Avery District, Cedar Creek.

Big Creek, Unit 4, C. E. Lundberg, Unit Supervisor

Camp No.	Camp Boss	Location
10.	Jack Wright	Calder District, forks of East Fork of Big Creek.
11.	John Stobie	Calder District, forks of the Middle Fork of Big Creek.
12.	George MacAuley	Calder District, Elsie Administration Site on Big Creek.
13.	Merrill Oaks	Ames Creek, part of the Middle Fork of Big Creek.

Mount Rainier National Park
M. C. Riley, in charge of operations

1.	Russel Dickson	Muddy Fork of the Cowlitz River in the southeastern part of the park (25 men - will be established July 1.)
2.	H. H. Thompson	Starbo camp on White River in the northeastern part of the park. (10 men - will be established July 1.)

California
W. V. Benedict, in charge of operations

1.	Eugene Kincaid	Dorrington area, northern part of the Stanislaus National Forest. (reeradication)

THE OLDEST KNOWN PINE INFECTION CENTER IN OREGON
H. N. Putnam

On May 14, 1931 Messrs. Goodding, Mielke and Putnam studied in some detail an old infection center near Minto Creek on the Santiam River, Linn County, Oregon, discovered by L. N. Goodding in the fall of 1930. This is the southernmost pine infection center known in the West.

The infected trees are growing on the edge of a talus slope occupying perhaps 10 acres. Surrounding this spot is a dense growth of over-mature Douglas fir and hemlock with an occasional mature white pine. Above the talus slope is a cliff perhaps 200 feet in height. Below the talus slope the ground slopes moderately to the Santiam River about a half mile distant. The elevation at the infection center is about 2,500 feet. The pines are comparatively slow growing even in the open although beyond 20 years of age the growth is very satisfactory. Small suppressed pines are occasionally found in the mature stand. A few scattered sugar pines have been found in this vicinity.

Several large clumps of Ribes sanguineum occur in close association with the heavily infected pines at the edge of the talus slope. Some of these clumps are 12 feet high with a diameter of 10 feet. R. lacustre occurs

occasionally in a mature stand. On Minto Creek approximately one-fourth of a mile south of the heavy infection center, R. bracteosum is moderately abundant. However, no infection was found on the pines growing close to R. bracteosum on Minto Creek.

In Table No. 1 there is shown an analysis of cankers made in the spring of 1931. In making this analysis no one tree was gone over completely. An effort was made to get a fair sample of the cankers on the area.

TABLE NO. 1

CANKER ANALYSIS, MINTO CREEK INFECTION CENTER, LINN COUNTY, OREGON
MAY 14, 1931

Individual Pine Infection							
Pine No.	Age	Height	Years Needles Borne	Crown Class	No. Cankers: Trunk	No. Cankers: Limb	Remarks
1	45	35	5.5	D			500 cankers on tree.
2	40	12	6.2	S			Approx. 100 cankers. Canker on 1913 wood is a limb-trunk canker. Limb dead, trunk alive 18" canker on limb, 18" on trunk. Another dead canker on 1914 growth.
Cankers on all but 1913 and 1914 growth occurred on middle third of pine No. 1							

Canker Analysis								
Year of Growth Infected	Number of Cankers							
	First Sympt.	Juve-nile	Pycnia Scars	Produced Aecia: Once	Twice	Several	Dead	Total
1927				2				2
1926		1	6	12	3			22
1925			2	10	6			18
1924				4	4	1		9
1923				1	4	1	2	8
1922						1	4	5
1921						9	11	20
1920						3	18	21
1919						9	12	21
1918						7	5	12
1914							1	1
1913						1		1
Totals		1	8	29	17	32	53	140

It is at once apparent from Table No. 1 that we have an old infection center at Minto Creek. It is believed that infection on 1913 and 1914 growth originated in 1917 and that heavy wave years occurred in 1921, 1922 and 1927.

More conclusive evidence regarding the age of this infection center was desired. On May 25, 1932 Messrs. Goodding and Putnam again visited the

area. Analysis of the cankers was made as completely as possible on two heavily infected trees.

In Table No. 2 there is shown the analysis of cankers on these two trees.

TABLE NO. 2

CANKER ANALYSIS OF CANKERS FOUND ON TWO TREES, MINTO CREEK INFECTION AREA LINN COUNTY, OREGON, MAY 25, 1932

Individual Pine Infection

Pine No.	Age	Height	Feet Needle Stem	Crown Class	No. Cankers	Years Needles Borne	Remarks
1	30	10'	250	S	88	5	
2	45	50'	4,000	D	250	5	No cankers seen on 1919 whorl or above. All cankers on lower half of tree. Doubtless many cankers on twigs fallen off.

Canker Analysis

Year of Growth Infected	Number of Cankers: First Sympt.	Juvenile	Pycnial Scars	Produced Aecia: Once	Twice	Several	Fruiting Previously But Not Now	Dead	Total
1927			2	1	11				14
1926			5		16	1	3		25
1925			4		22	8	5	2	41
1924					5	10	4		19
1923						13	4	2	19
1922					1	10	3	5	19
1921						12	4	16	32
1920						12	3	12	27
1919						14	3	9	26
1918						16	3	3	22
1917						10	2	5	17
1916						4		5	9
Not Known							19	49	68
Total			11	1	55	110	53	108	338

In addition to the cankers shown in Table No. 2 there were also found three cankers of older origin on three trees in the vicinity. These

cankers were as follows: 1 canker fruiting several times, 1913 wood; 1 dead canker, 1914 wood; 1 canker fruiting several times, 1915 wood.

The canker pattern in Table No. 2 is not clear. It is obvious that there is an old infection center here but to pick out the wave years is not possible from the canker analysis. In analyzing these old cankers there is a high probability of error in the determination of the year of growth at the center of the canker. It is highly probable that some of these cankers listed as appearing on wood of 1916 to 1920 growth might have come in on adventitious shoots of younger ages which were not present at the time of examination. However, it is not reasonable to think that all of the cankers entered in that way. It is conceivable that infection originated in 1917 with wave years in 1920, 1921 and 1922, with other years of heavy infection in 1926 and 1927. It is probable that infection occurred every year after 1920. Owing to the fact that the trees bore their needles five years, infection of any one year could be distributed over four or five years' growth. This probability, coupled with the probability that infection took place each year after 1920, makes the data very difficult to analyze.

The peculiarity of this infection center is the dearth of cankers of 1927 or younger origin. No explanation is offered for this unusual circumstance. _R. sanguineum_ are abundant and in close association with the pines. The aecial volume each year is enormous. Perhaps due to their heavy infection, _R. sanguineum_ leaves fell to the ground early before much telial development took place. Possibly very few telia were produced on the _R. sanguineum_ here. The explanation for this dearth of 1927 origin cankers most likely was chiefly influenced by the Ribes factor. _R. sanguineum_ infection was found on May 14, 1931 at this point. At that time the Ribes infection appeared as small yellow spots with a few suggestions of uredinial mounds. On May 25, 1932 the _R. sanguineum_ bushes were quite carefully gone over. No yellow spots or incipient Ribes infection were seen but two leaves were found infected, each leaf having a cluster of 6 or 8 uredinial sori in which uredinia were being produced and disseminated.

Scouting in the general vicinity of this infection center showed that infection has not spread very rapidly. An occasional canker, probably of 1927 origin, was found. On the Santiam River, about one and a half miles from the infection center, one small suppressed white pine was found having 30 feet of needle stem and bearing its needles 5 years. On this tree 6 cankers were located, very probably of 1927 origin. This tree was within a few feet of a _R. sanguineum_ bush. One juvenile canker was found this spring on a pine at Pamelia Creek about 4 miles north of the Minto Creek infection center. A canker of similar stage was found on Pamelia Creek in the spring of 1931. A very few cankers were found in the fall of 1930 south of the Minto Creek infection area along the trail for a distance of one and a half miles.

The salient facts regarding the Minto Creek infection area are as follows:

In an opening formed by a rock slide within an over-mature dense stand of Douglas fir and hemlock, there is a small infection center in which the pines are heavily infected.

Analyses of cankers made in the springs of 1931 and 1932 indicate that infection possibly originated here in 1917 with infection each year from 1920 to 1927. Possibly more than the average amount of infection occurred in 1921, 1922 and 1927.

One of the outstanding peculiarities of this infection is the dearth of 1927 origin cankers, in a situation in which R. sanguineum bushes are abundant and closely associated and in which the volume of aecia is very large each year.

In considering the length of time infection has probably been established here, there has been very slight spread of infection from the old center.

NOTES

Elers Koch, R. H. Weidman and Lyle Watts of Region 1, Forest Service, E. C. Rettig of the Clearwater Timber Company and E. L. Joy, and C. C. Strong spent May 23 to May 28 inspecting areas of heavy blister rust infection in the vicinity of Revelstoke and Nelson, British Columbia.

* * *

L. N. Goodding, Oregon State Leader and Professor H. P. Barss of Oregon State College examined infection areas near Revelstoke, British Columbia June 16 to 21.

* * *

Dr. C. W. Waters left Spokane June 23 for Headquarters, Idaho, where he will conduct ecological studies.

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W E S T E R N B L I S T E R R U S T
N E W S L E T T E R

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Summer Issue No. 2

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

NEW INFECTION CENTERS

E. L. Joy

During this season new pine infection centers have been located on the Clearwater National Forest, Clearwater Timber Protective Association, and Coeur d'Alene National Forest. There is now a total of 67 known centers in the Inland Empire. Following is the location and description of the new centers:

Clearwater National Forest

1. In the vicinity of the Weitas Ranger Station, T. 37 N., R. 8 E., S. 9, 10, 15 and 16. This center was first reported by Swanson in 1931. This year cankers have been found at four different points in the vicinity of the Ranger Station. The main center extends for three quarters of a mile up Hemlock Creek from the mouth and for approximately ten chains up each slope at the widest place. Although no detailed study has been made of this center, indications are that it originated about 1927.

2. South of Quartz Creek in T. 40 N., R. 8 E., Sec. 22. This center, an upland infection, is on a low ridge approximately 15 chains from the North Fork of the Clearwater River and between two small seeps, each about 5 chains distant. It is estimated that about 2,000 feet of *Ribes viscosissimum* and *R. lacustre* (about 99% *R. viscosissimum*) per acre occurred on this area before eradication.

This center originated in 1927 and was greatly intensified by a wave of infection in 1930 as is shown by the following analysis of all the cankers found on 23 trees.

ANALYSIS OF ALL CANKERS FOUND ON 23 TREES, INFECTION ALONG THE NORTH FORK OF THE CLEARWATER RIVER NEAR QUARTZ CREEK

Year of Wood Infected	First Sympt.	Juve-nile	First Pycnia	Pyc. Scars	Fruited 1	Fruit. 2	Fruit. Sev.	Dead	?	Total
1930	1	4								5
1929	2	40	1							43
1928	17	164	6							187
1927	15	93	6	4	1					119
1926	3	14	2	3	8	20	3	7		60
1925				4	3	22	3	1		33
1924				1		7		4	2	14
1923					1		1			2
1922										0
1921										0
1920					1					1
?				1	2	1		2	34	40
Total	38	315	15	13	16	50	7	14	36	504

The older group contains 82 clean cut cankers of 1927 origin while the new group consists of 368 cankers of 1930 origin. It is estimated that about 300 cankers on trees within a 4-square chain area formed the original center. New cankers were found in abundance on trees up to 3 chains from the original center and less plentiful at 5 and 6 chains.

3. Skull Creek one mile northeast of the mouth of Collins Creek, T. 41 N., R. 8 E., Sec. 26. One canker only of 1927 origin.

4. North Fork of the Clearwater River 1/4 mile north of the mouth of Quartz Creek, T. 40 N., R. 8 E., Sec. 15. One canker only of 1927 origin.

5. Quartz Creek along the trail 1/2 mile up from the mouth and 100 yards south of the creek, T. 40 N., R. 8 E., Sec. 15. Two cankers only of 1927 origin.

Clearwater Timber Protective Association

1. Alder Creek, 1 mile below railroad on Big Island road. T. 38 N., R. 5 E., Sec. 9. Infection is quite general in this vicinity both along the creek and up the slopes. This center is estimated to be of 1927 origin.

Coeur d'Alene National Forest

1. Little North Fork of the Coeur d'Alene River extending below the mouth of Burnt Cabin Creek for approximately one mile. T. 51 N., R. 1 W., Sec. 8. Strong reports that infection is quite heavy centering around the mouth of Burnt Cabin Creek. This infection is probably of 1927 origin.

Several infection centers found in previous years have been scouted this summer. It is noticeable that the centers occurring along the streams where Ribes were removed in 1929 and 1930 have very few, if any, incipient cankers. On the Quartz Creek area, T. 37 N., R. 5 E., Sec. 9, Clearwater Timber Protective Association, from which all cankers found in 1930 and 1931 were removed, only 35 scattered cankers were found. All of these were of 1927 origin. It is interesting to note that only five of these cankers produced aecia this year.

SUMMARY OF RIBES ERADICATION WORK UP TO JULY 31, 1932

Ribes eradication crews, working on five areas in Idaho and one in Washington, have removed the Ribes from 65,868 acres of white pine land, by hand pulling methods during the 1932 field season. This figure includes work done up to July 31. In addition 2,795 acres have been covered by the chemical eradication crews. Of the total area covered by hand methods 9,590 acres were in stream type and 56,278 acres in upland types.

The following two tables give the figures in detail for the work done during July by working units and the cumulative totals for the entire season. Cost figures are not included.

TABLE NO. 1

SUMMARY OF RIBES ERADICATION IN IDAHO AND WASHINGTON, JULY, 1932 HAND ERADICATION

Project	Stream Type					Upland Types					All Types				
	Acres Worked	Total Man Days	Total Ribes	Man Days Per Acre	Ribes Per Acre	Acres Worked	Total Man Days	Total Ribes	Man Days Per Acre	Ribes Per Acre	Acres Worked	Total Man Days	Total Ribes	Man Days Per Acre	Ribes Per Acre
St. Joe N.F.	840	1,207	320,316	1.44	381	6,452	4,937	1,226,824	.77	190	7,292	6,144	1,547,140	.84	212
Clearwater N.F.	3,762	1,555	528,565	.42	140	24,736	6,306	2,527,659	.25	102	28,498	7,861	3,056,224	.28	107
Clearw. Ass'n.	* 832	305	113,288	.37	136	8,597	1,028	314,623	.12	37	*9,429	1,333	427,911	.14	46
Clarkia Area	61	48	8,881	.80	146	532	109	11,032	.20	21	593	157	19,913	.26	32
PriestLake Area	409	173	60,205	.42	147	6,980	1,327	354,402	.20	51	7,389	1,500	414,607	.20	56
Idaho Totals	5,904	3,288	1,031,255	.56	175	47,297	13,707	4,434,540	.29	94	53,201	16,995	5,465,795	.32	103
Mt.Rainier N.P.	* 222	462	63,525	2.08	286	40	66	11,471	1.65	287	* 262	528	74,996	2.01	286
July Totals, Northwest	6,126	3,750	1,094,780	.61	179	47,337	13,773	4,446,011	.29	94	53,463	17,523	5,540,791	.33	104
June Totals, Northwest	3,464	2,722	729,538	.81	211	8,941	4,818	1,473,601	.54	165	12,405	7,540	2,203,139	.61	178
Cumulative Totals, Northwest	9,590	6,472	1,824,318	.67	190	56,278	18,591	5,919,612	.33	105	65,868	25,063	7,743,930	.38	117

*Part reeradication.

TABLE NO. 2

CHEMICAL ERADICATION

Project	Acres	Man Days	Gallons Spray	Per Acre	
				Man Days	Gallons Spray
St. Joe National Forest	442	513	11,913	1.16	27
Clearwater N. F.	1,427	581	13,054	0.34	9
Clearwater Association	283	328	8,611	1.16	30
Clearw. Ass'n. Respray	288	112	1,586	.39	5
Clarkia Area	32	48	1,397	1.50	44
Clarkia Area Respray	13	16	422	1.27	32
July Total	2,485	1,598	36,983	.64	15
June Totals	310	214	4,663	.69	15
Cumulative Totals	2,795	1,812	41,646	.648	14.9

RECENT WAVES OF INFECTION IN THE INLAND EMPIRE

H. N. Putnam

On June 8, 1932, Messrs. Hubert, Joy, Stouffer and Putnam visited infection centers on St. Maries River near Clarkia, Cameron Creek and Ruby Creek, Idaho. Incipient cankers were fairly numerous.

In the following table there is shown a complete analysis of cankers on one tree on the St. Maries River infection area near the junction of Gold Center Creek and St. Maries River. The pine examined was a dominant-free tree 20 years old, 18 feet high, with 1,250 feet of needle stem and bearing its needles between 3 and 4 years counting this year's needles as current.

CANKER ANALYSIS ON ONE WHITE PINE, ST. MARIES RIVER INFECTION, NEAR GOLD CENTER, IDAHO, JUNE 8, 1932

	Number of Cankers									
					Produced Aecia					
Year of Growth Infected	First Symptom	Juvenile	Fresh Pycnia	Pycnia Scars	Once	Twice	Several Times	Previously But Not Now	Dead	Total
1930	19									19
1929	13	2								15
1928	1				1					2
1927					10	4		3		17
1926					3	18	2	2		25
1925					1	2	1	1	1	6
1924						1				1
Total	33	2			15	25	3	6	1	85

From the canker analysis, it is quite clear that so far as this individual tree was concerned, it was first attacked by blister rust in 1927 as represented by the columns "produced aecia twice" to "dead". In these columns the youngest growth found infected is 1927 with the majority of the cankers falling on 1926 growth clearly indicating, according to Lachmund's canker arrangement, 1927 as the year of origin of infection.

The pattern of cankers in the column entitled "produced aecia once" indicates that these cankers represent a 1928 wave of infection.

Of the 85 cankers found on the tree, 35 of them or over 40 per cent were classified as "first symptoms" or"juveniles". These cankers obviously originated in 1930. Quite peculiarly the greatest number of these cankers, 19, were found on 1930 growth. The needles on the branches supporting these young cankers were for the most part borne only three years, including the current season's needles which were just unfolding. The canker pattern of

these young cankers resembles quite strongly the pattern we often find on *P. strobus* trees bearing their needles only 2 or 3 years.

From the canker analysis above described we have quite clear evidence that infection took place in 1927, 1928 and 1930. The exclusion of any cankers of 1929 origin is probably significant of what we may expect in the Inland Empire. Cankers of 1929 origin in the spring of 1932 would naturally occupy the columns from "juvenile" to "produced aecia once" with the greatest number of such cankers found on 1928 wood. In the spring of 1931 if there had been an appreciable wave of infection in 1929 we would have expected to find an appreciable amount of "first symptoms" and "juveniles". Scouting and infection studies in 1931 failed to show this condition.

This dearth of 1929 origin cankers was to be expected and may be explained as follows: Canker analysis at the various infection centers in Idaho have shown that 1923 was the probable year of origin of the majority of such centers. Cankers originating in 1923 at the very earliest would have produced aecia in 1926, three years after their origin. Only a relatively small per cent of 1923 origin cankers produced aecia in 1926. The great majority of them fruited for the first time in 1927.

The cankers of 1923 origin probably produced their maximum number of aecia in 1927 and 1928. By 1929 a large proportion of the cankers of 1923 origin undoubtedly were dead or so near death that they were unable to produce aecia. In 1929, therefore, there were probably very few aecia produced on 1923 origin cankers. The only other possible source of aecia in 1929 would be a few advanced cankers of 1926 origin fruiting for the first time. Canker analyses at different points have shown that there were very few cankers of 1926 origin. The only place in the Inland Empire where cankers of 1926 origin were found in sufficient quantities to show in a canker pattern was on the Long Meadow infection area. Of these cankers formed in 1926 only a relatively small number produced aecia in 1929.

The year 1929, so far as the Inland Empire was concerned, was a season of prolonged periods of low relative humidity with the rainfall much below the average. This condition particularly obtained during the late summer and fall, the time when infection of the pines is usually most active.

The explanation, then, for the dearth of 1929 origin cankers is based upon 3 major points: (1) the relatively small volume of aecia from 1923 origin cankers because such cankers were rapidly dying out; (2) the very negligible number of aecia from cankers of 1926 origin, because only a small per cent of the few cankers formed in 1926 produced aecia in 1929; and (3) exceptionally dry weather conditions throughout the 1929 summer season and particularly at the time of pine infection made conditions unfavorable for pine infection.

On the other hand conditions in 1930 were very different. Analyses of the various infections have shown that the year 1927 was the year of origin of very large numbers of cankers. Although a relatively small per cent of these cankers produced aecia in 1930, nevertheless the large numbers of such

cankers were sufficient to cause a very heavy aecial production. In addition there were still a few cankers of 1923 origin producing aecia and the few cankers of 1926 origin were producing aecia more abundantly than in 1929. However, it is believed that the amount of aecia from these last two named sources was negligible when compared to the enormous volume of aecia from 1927 origin cankers.

In the fall of 1932 and spring of 1933 we may expect tremendously large numbers of "first symptoms" and "juvenile" cankers originating from Ribes infection in 1931 caused by the greatly increased volume of aecia present in the spring of 1931 from cankers chiefly of 1927 and 1928 origin.

Excluding the cankers found this spring of 1930 origin, all of the millions of cankers now damaging white pine stands in the Inland Empire must necessarily have come from Ribes infection caused by relatively few cankers of 1923 origin. Cankers of 1923 origin as already stated, fruited to a limited extent for the first time in 1926 and more abundantly in 1927 and 1928. All cankers, therefore, originating in 1928 or before, must necessarily be chargeable to Ribes infection resulting from aecia from a relatively small number of cankers. The first effects of the further spread and intensification of the rust from these large numbers of cankers of 1927 and 1928 origin, will be noticeable beginning this spring. Since the volume of aecia in 1930 and 1931 was many thousand times that responsible for the large 1927 and 1928 waves, it follows that the waves of infection now forming will be tremendous and practically beyond our comprehension. It is impossible to come to any other conclusion but that every pine stand in the Inland Empire in which Ribes are present must become infected in a very few years.

Mr. Offord recently held forth with his usual force and clearness on the difference between knowledge and realization, illustrating from his own experience the difference between these two concepts. We have the knowledge or "acquaintance with fact" as defined by Webster, that something is going to happen but we are unable to grasp the full import of this knowledge until the thing happens and we have the full realization of it. Applying this idea to the intensification of the rust, particularly in the Inland Empire, our studies and investigations of the rust give us knowledge so startling that we refuse to accept it or else feel that it is an exaggeration of what will happen. When we see with our own eyes that events have come to their logical conclusion and we arrive at the realization of the high rate of intensification of the rust, we find that our knowledge erred on the side of conservatism rather than on the side of exaggeration. In the Inland Empire we are on the threshold of the stage of realization of the high rate of intensification of the rust. In a very few years we will be realizing the high damaging power of the rust which our knowledge tells us must occur.

RELATIVE SUSCEPTIBILITY OF SOME OREGON RIBES TO GOOSEBERRY ANTHRACNOSE

L. N. Goodding

Ribes studies made in connection with white pine blister rust work in Oregon have led to the planting on the Oregon State College farm

of several native species of Ribes, as well as some of the common horticultural varieties. As these were not planted for fruit production, no special effort has been made to keep them free from the common insect pests and diseases. Since the gooseberry anthracnose (Pseudopeziza ribis) is common here, the suggestion was made that a note regarding the observed differences in susceptibility of the native species planted in this area might prove enlightening, especially since some of these may be used in cross-pollination and selection work with a view to producing commercial varieties.

Data for the following table were taken on June 2, 1932. The species are here listed in the order of the severity of attack.

TABLE NO. 1

RELATIVE SUSCEPTIBILITY OF SEVERAL OREGON RIBES TO ANTHRACNOSE

* Species	No. of Bushes Exam.	Degree of infection	Remarks
R. velutinum (glabrous leaf)	5	Severe	Heavy defoliation on two bushes.
R. velutinum (Pubescent leaf)	1	Severe	Heavy defoliation followed by strong terminal growth.
R. klamathense	20	Abundant	Recent growth comparatively free.
R. cruentum	15	Abundant	Defoliation much heavier on some bushes than on others.
R. watsonianum	3	Abundant	No recent leaves by which recovery could be judged.
R. roezli	5	Abundant	Infection and defoliation rather heavy on two bushes with only slight infection on three.
R. viscosissimum	1	Abundant	No recent growth by which recovery could be judged.
R. irriguum	20	Mild	Only older leaves show infection.
R. marshallii	20	Slight	An examination of the spores indicates that this may be a different anthracnose or a host variation.
R. divaricatum	2	Trace	
R. nevadense	5	Trace	
R. cereum	2	Free	
R. lobbii	6	Free	
R. wolfii	3	Free	
R. hallii	5	Free	
R. binominatum	14	Free	
R. menziesii	15	Free	
R. sanguineum	8	Free	
R. glutinosum	8	Free	

*Arranged in order of their susceptibility.

RIBES BRACTEOSUM BEHAVES NATURALLY IN FRANCE

In a recent letter to S. N. Wyckoff, Rene d'Urbal, now traveling through France and other parts of Europe, reported having observed Ribes bracteosum in the Botanical Gardens at Versailles, France. Not only was this Pacific Northwest species doing nicely there but it also had white pine blister rust, in the uredinial stage, on the foliage. Rene said that he had no difficulty in identifying this species even though the legends were faded and hard to read.

PINE INFECTION IN HONEYSUCKLE AREA

C. C. Strong

While examining the Ribes inerme concentrations on the Little North Fork of the Coeur d'Alene River with a view of clearing out these Ribes late this season with a bulldozer, the writer discovered blister rust infection on pines over a rather extensive stretch of stream type. A hasty examination indicated that the center of the infection was located at the junction of the Little North Fork and Burnt Cabin Creek. Here the infection is rather heavy with numerous flags. This center is about 10 acres in area. Cankers were found downstream about three-quarters of a mile and up the Little North Fork about one-quarter of a mile from the center. The original infection took place in 1927 as nearly as could be determined.

It will be remembered that when Ribes eradication was performed in this region in 1927 and 1928 there existed rather heavy concentrations of R. inerme in stream type with the usual mixture of R. lacustre. Pending the development of a practical method of treating these concentrations, they were left for future working. The infection center is at the lower end of the concentration extending from just below the mouth of Burnt Cabin Creek to a point near the mouth of Iron Creek. It was encouraging to note that no cankers had originated since 1927 on the lower limits of the infection area which is better than a quarter of a mile within the area from which complete Ribes eradication was accomplished in 1927.

METHODS CREW HAS BIG JOB

The methods crews on Orogrande Creek have a full quota of work ahead of them if the work outlined is to be completed by the time camp will have to close.

At the present time two power spraying outfits are being used. The larger of the two uses two motors, one 4-cylinder motor for pumping chemical solution and a 2-cylinder motor to supply water to the mixing vats. A $1\frac{1}{2}$-inch main line fire type hose and two $1\frac{1}{4}$-inch laterals are used. Three laterals were tried but not enough pressure could be maintained for efficient work. This unit puts out about 4,000 gallons of solution daily. The other unit uses one 1-cylinder motor and 1/2-inch main line pressure hose with 1/4-inch laterals. Four laterals are used. The larger unit sprays Ribes and drenches the soil in a broadcast method, using $1\frac{1}{2}$ to $2\frac{1}{2}$ per cent solution, while the smaller does a selective job on Ribes only, with the soil around the bush being well treated, and using a stronger solution. The area

being worked supports dense brush with heavy concentrations of Ribes inerme and R. petiolare. Beaver swamps complicate the situation.

Application of ammonium thiocyanate on the R. petiolare plots on Shake Creek, a tributary of the Orogrande, was completed July 12. Three areas were sprayed early in the season, using 5, 10 and 15 per cent solutions and the same series were run in the late application except that the five per cent was omitted. Knapsack tanks were used on all plot applications.

R. L. Wolcott and his crew are still working on the ammonium thiocyanate and sodium chlorate rotation plots on the main stream. These plots are designed to test the effectiveness of these chemicals on R. inerme. These plots are laid out with 24 plots one rod square in each main plot. Twelve of the small ones are soil treated only, while on the other 12 both the aerial parts of the Ribes and the soil are treated. Three amounts of chemical are used, four plots receiving the same amount of chemical with varying amounts of water. The same solution series is used on each of the 12-plot units.

Checking of last year's 72 drenching and dry application plots has been completed and the check of the 1931 power sprayed areas is now in progress. A new method of checking originated by H. E. Swanson and designed to give information on the relation of Ribes sites to effectiveness of the spray is being used.

Plans have been made to respray the early 1932 power areas as well as the rotation plots. Only the half of these plots on which both the bushes and soil were treated will be resprayed. Knapsack sprayers will be used on the plot work and one of the power units on the original power sprayed area.

Wolcott is also working on the individual bush studies on R. inerme, R. petiolare and R. lacustre. These bushes are being staked and tagged this season so that definite information will be available next year when they are checked.

BIOLOGICAL CONTROL OF GORSE

L. N. Goodding

Biological control has many aspects. Some have been suggested in our personnel meetings and in News Letter articles. The alleviation of the blister rust menace by means of controlling the Ribes either by suppressing them with grasses and other vegetation or by destroying them by means of insects or diseases is biological control. It should not be out of place to discuss briefly how the problem of the control of a pest plant by means of insects is undertaken, or perhaps it should be said the procedure that is generally followed.

E. H. Carter, in the Bulletin of Entomological Research, London, for June, 1931, discusses the problem of the control of gorse by means of insects. I wish to glean from this paper some suggestions for our biological control-minded blister rusters. Carter speaks of the preliminary studies necessary before biological control of any plant is undertaken. This might be

summed up in the phrase: a thorough ecological study of the plant in question, including seed germination, seedling establishment, flowering, seed dispersal, plant communities, climate, soil, distribution and lastly relation to insects.

In contrast to our Ribes problem, gorse where it is a pest is an introduced plant. It may be interesting to note that it is rapidly assuming the aspect of a pest along the Oregon Coast. In many places it is grown as an ornamental and is even used as a green manure crop, but in certain parts of New Zealand and Australia its rapid spread has led to the necessity for control.

Carter discusses the flowering and fruiting habits of the gorse, its ability to spread by means of adventitious buds, its poor adaptability to calcareous land, the results of germination tests, methods of seed dispersal, factors influencing seedling establishment, and finally relation to insects.

In discussing germination he speaks of "hard" seeds, referring to those which do not readily take up moisture and in which germination may be delayed for years.

His studies on seedling establishment read much like many of ours on Ribes. He concludes that gorse is likely to spread only where the land has been overgrazed, where the ground has been burned over, or places where rock and mineral soil are naturally exposed.

The studies of insects, like the others, were made in England with the object of utilizing any of the promising insects in New Zealand. Not only was it necessary to study the insects' food habits under normal conditions, but it was also necessary to put them on a starvation diet--I presume to try them on other hosts to make sure some serious pest on other plants might not be turned loose in a new country.

The result of all the investigation was that the chief introduction into New Zealand was Apion ulicis, an insect which feeds primarily on the pods. This insect has not adapted itself well to the New Zealand climate up to the present, and as a result it is highly probable others will be tried.

In the control of gorse in New Zealand, the aim has not been to destroy the plant as it is considered valuable for hedges. The aim has somewhat complicated the control. No attempt was made, apparently, to breed the insect free of its native parasites, and thus give it a free hand. In fact it has been one of the principles of control of plants by insects to introduce the native parasites to prevent serious outbreaks of the introduced insects. This principle was not adhered to in the control of Lantana in Hawaii, however, the control of which has been far more satisfactory than has been that of gorse in New Zealand.

It may not be possible to limit Ribes by means of insects, but there can be no harm in considering the chances and making observations on insect damage when such is encountered. Our main hope in this would be that a foreign insect could be introduced and his enemies left behind. In this connection we would need to have in mind the enemies and methods for their introduction in case our pests threatened to get beyond control.

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WESTERN BLISTER RUST

NEWS LETTER

* * *

Confidential

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

REERADICATION WORK IN CALIFORNIA

W. V. Benedict

The reeradication of Ribes on the Dorrington area of the Stanislaus National Forest, California was completed in August. The following table summarizes the work for the season:

SUMMARY OF REERADICATION

Type	Acres	Man Days	Seedlings		Sprouts		Missed		Total Ribes Eradicated		Average Per Acre	
			Bu.	F.L.S.	Bu.	F.L.S.	Bu.	F.L.S.	Bu.	F.L.S.	Bu.	FLS
Str.	207	63.2	5837	5,278	1456	8,793	741	28,569	8034	42,640	39	206
SP-F	905	163.2	17795	5,549	6801	24,725	2379	24,164	26975	54,438	30	60
Br.	52	27.6	1993	2,351	2374	16,082	210	4,925	4577	23,358	88	449
SP-YP	1681	144.2	3049	4,424	2736	14,815	7176	155,395	12961	174,634	8	104
BO	5705	41.0	-	-	-	-	-	-	-	-	-	-
Total	8550	439.2	28674	17,602	13367	64,415	10506	213,053	52547	295,070	6	35

The entire area was thoroughly checked first by the camp boss as the work progressed and finally by the reconnaissance men and myself. Both checks showed less than 25 feet of Ribes live stem per acre on any part of the area.

As an experimental study regular eradication scout crews worked some of the blocked out (BO)areas. In 40 man days they systematically covered 2,487 acres of the 5,705 acres blocked out by the camp boss and eradicated 1,667 Ribes totaling 23,527 feet of live stem. This is an average of .6 Ribes and 9 feet of live stem per acre, a substantiation of the checking results.

SUMMARY OF 1932 RIBES ERADICATION WORK IN IDAHO AND WASHINGTON UP TO AUGUST 31

During the month of August hand eradication crews in the Pacific Northwest removed Ribes from 37,940 acres of land to bring the total for the season to 103,808 acres. Of this amount 12,859 acres was in stream type and 90,949 in upland types. In addition to the area worked by hand methods 1,112 acres were covered in August by chemical eradication crews swelling the season's total by that method to 3,907 acres.

The Clearwater National Forest project showed the greatest acreage worked in August with 16,950 acres and also the highest Ribes population with an average of 227 per acre. The Clarkia area was lowest in both respects with 316 acres worked and 69 Ribes per acre. Altogether the crews working on five areas in Idaho and one in Washington have removed 14,225,857 Ribes from the forests, an average of 136 per acre.

The following two tables summarize the eradication work from the start of the season to August 31:

SUMMARY OF RIBES ERADICATION IN IDAHO AND WASHINGTON, AUGUST, 1932

Hand Eradication

Project	Stream Type					Upland Types					All Types				
	Acres Worked	Total Man Days	Total Ribes	Man Days Per Acre	Ribes Per Acre	Acres Worked	Total Man Days	Total Ribes	Man Days Per Acre	Ribes Per Acre	Acres Worked	Total Man Days	Total Ribes	Man Days Per Acre	Ribes Per Acre
St.Joe N.F.	629	848	124,036	1.35	197	8,811	5,598	1,553,739	.64	176	9,440	6,446	1,677,775	.68	177
Clearwater N.F.	1,590	511	151,038	.32	95	15,360	5,348	3,690,184	.35	242	16,950	5,859	3,841,222	.35	227
Clearwater Association	748	202	61,850	.27	83	5,815	1,498	425,853	.26	73	6,563	1,700	487,703	.26	74
Clarkia Area	70	48	7,230	.68	103	246	141	14,502	.57	59	316	189	21,732	.60	69
Priest Lake Area	71	39	11,636	.56	164	4,133	1,417	361,213	.34	87	4,204	1,456	372,849	.35	89
Idaho Totals	3,108	1,648	355,790	.53	114	34,365	14,002	6,045,491	.41	176	37,473	15,650	6,401,281	.42	171
Mt.Rainier Nat'l. Park	161	425	51,106	2.64	317	306	189	29,450	.62	96	467	614	80,646	1.31	173
Aug. Totals Northwest	3,269	2,073	406,896	.63	124	34,671	14,191	6,074,941	.41	175	37,940	16,264	6,481,927	.43	171
June & July Totals, N.W.	9,590	6,472	1,824,318	.67	190	56,278	18,591	5,919,612	.33	105	65,868	25,063	7,743,930	.38	117
Cumulative Totals, N.W.	12,859	8,545	2,231,214	.66	174	90,949	32,782	11,994,553	.36	132	103,808	41,327	14,225,857	.40	136

Chemical Eradication

Project	Acres	Man Days	Gallons Spray	Per Acre	
				Man Days	Gals. Spray
St.Joe National Forest	584	594	15,667	1.02	27
Clearwater National Forest	251	387	12,155	1.54	48
Clearwater Ass'n. Respray	240	142	2,298	.59	10
Clarkia Area	16	45	1,450	2.83	94
Clarkia Area Respray	21	21	560	1.00	27
August Total	1,112	1,189	32,130	1.07	29
June & July Totals	2,795	1,812	41,646	.65	15
Cumulative Totals	3,907	3,001	73,776	.77	19

SHOULD THIRTY-YEAR OLD DENSE REPRODUCTION STANDS BE ERADICATED OF RIBES

B. A. Anderson

This year the Ribes eradication camps at Headquarters, Idaho are working the hillsides of the Alder Creek drainage. Within this drainage are several large areas which were burned over about thirty years ago. Where these burns occurred a dense stand of white pine reproduction has restocked the areas.

During the first twenty years after the fire all the reproduction in these areas seemed to make about the same yearly height growth. After twenty years certain trees have forged ahead into the dominant class and are now making a height growth of about 20 inches per year. Lower branches are beginning to shade off.

A check of the number of Ribes in these stands shows that the burned-over areas furnished ideal conditions for the germination of Ribes seeds. Approximately three hundred Ribes viscosissimum and R. lacustre bushes occur per acre. But it is the condition of these Ribes which attracted my attention. One area in particular which I have in mind is located on a northwest-facing slope with practically no openings and Ribes concentrations uniform. R. viscosissimum bushes are beginning to shade out. Almost all of them show an original bush of about twenty or forty feet of live stem, but at the present time fully two-thirds of the original live stem has died out, and the living branches have only two or three leaves remaining. R. lacustre seems to be a little more tolerant and will probably survive several years after the R. viscosissimum has been crowded out.

Although this area is a fine example of the age at which Ribes are choked out in a densely stocked stand of white pine, and also the difference in tolerance between R. lacustre and R. viscosissimum, I was particularly interested in the area from the Ribes eradication standpoint,

It would undoubtedly cost five to six dollars per acre to eradicate the Ribes from such an area. In my opinion practically all Ribes will be choked from such a stand within from five to ten years. Could the eradication forces leave such an area unworked and feel reasonably sure that very small damage would result if blister rust happened to hit the stand? Even though the rust did hit, and about forty per cent of the reproduction were killed before the Ribes died, would any material damage result? Eventually a much larger percentage of trees will be lost. Does an area of this kind represent much of a blister rust hazard? Ribes are plentiful but contain only a few square inches of leaf surface per bush.

What would the objections be to leaving such a high-cost eradication area unworked, inspect it periodically, and if blister rust infection were found, then do the Ribes eradication work? If we can get old Mother Nature to choke out the Ribes at the total cost of zero dollars plus

interest compounded semi-annually without jeopardizing the rest of the area eradicated of Ribes, she is going to be on our permanent staff - depression or no depression.

We can give you the answer in about five years (unless someone burns the area we have staked out), but what we want now is your best opinion or knowledge of what is going to happen to those Ribes during the five to ten-year hiatus and of how much damage they are capable in their present run-down condition. We expect to do a lot of Ribes eradication work in the next five years and we have a place for every available dollar. If we can safely leave the dense reproduction areas in the twenty-five to thirty year age class, it is going to save a good many dollars in Ribes eradication costs.

BIOLOGICAL CONTROL BY MEANS OF THE PURPLE MOLD

E. E. Hubert

I am sure the readers of the News Letter have enjoyed the notes on biological control contributed by Goodding, and I have been particularly interested in noting the mounting attention given to this phase of the control studies. Some recent information on this subject is therefore presented. Due to a fortunate receipt of a fresh supply of the purple mold, Tuberculina maxima, it has been possible to make a few field inoculations on young blister rust cankers during July and August of this year. The cankers thus treated showed but few sporulating aecia but bore an abundance of pycnial drops and on these were placed the spores of the purple mold. So little is known regarding the life history of this parasite of the white pine blister rust that the best season for inoculating cankers has not been accurately determined. However, the prevalence of the purple mold on pycnial areas makes me suspect that a good start might be made by infecting the pycnial stage. Several inoculations were made on infected pines in the Middle Fork of the St.Maries River, and following this, a number of cankers in the pine infection area at the mouth of Burnt Cabin Creek in the Coeur d'Alene National Forest were also inoculated with purple mold. Since insects (a variety of flies, ants and yellow jackets) frequent the cankers and feed upon the pycnial juice, it is possible that they may act as carriers of the purple mold spores and so inoculate other cankers in the vicinity. Pierson has made similar observations regarding the insect visitors on pycnial areas, and reports yellow jackets feeding greedily upon the sweet liquid.

An interesting development has been observed this year at the Newman Lake plot. Pierson reported a purple mold-like growth on some of the cankers and when I visited the area in August, I found the infection to be typical of Tuberculina maxima. Examination of some of the purple covered aecial pustules under the microscope clinched the determination. It is apparent that the purple mold developing normally on the local rusts of lodgepole and ponderosa pine had transferred to the white pine blister rust and there established itself. Every canker showing purple mold gave evidence that aecial sporulation had been arrested. Little is known regarding the

environmental factors favoring Tuberculina maxima so that it is not easy to select experimental areas nor to predict the success of artificial inoculations. However, it is believed that the environment favorable to blister rust development must also be favorable to the purple mold.

Control experiments would be immensely simplified if a successful method of culturing large quantities of the purple mold in the laboratory could be developed. With nothing but old spore material available and a too brief period in which to carry on the work, Stouffer tried several culture media but found none which were favorable. At the present time the only culture of the fungus which are alive are developing upon small strips of white pine bark infected with blister rust and on which the purple mold is established. These bark strips are placed on the surface of malt agar slants. How long these cultures will remain active is problematical.

Collections of fresh material of the purple mold and data on the life history of this interesting parasite of the blister rust are greatly needed and it is hoped those interested in blister rust control will contribute. I wish to take this opportunity of expressing my appreciation of the cooperation already extended by members of the Division of Blister Rust Control and the Division of Forest Pathology at Portland.

LOCATE MORE INFECTION CENTERS

Scouting operations since mid-August have brought to light eight new centers of pine infection in Idaho, bringing the total known centers in the Inland Empire to 75.

Four of the eight new centers located are on the Coeur d'Alene National Forest making a total of seven within that area; two are near Fernwood, Idaho; one near Clarkia, Idaho; and one near the Oxford Ranger Station on the Clearwater Timber Protective Association.

Coeur d'Alene National Forest

1. Rock City Ranger Station. T. 52 N., R. 3 E., Sec. 32. One canker only on pine in ranger station grounds. Probably 1927 origin.

2. Emery Creek, one mile below Rock City Ranger Station. T. 52 N., R. 3 E., Sec. 33. Twenty cankers found on 10 trees. Probably 1927 origin.

3. Scott Creek. T. 50 N., R. 2 E., Sec. 24. Few cankers found on scattered trees. Probably 1927 origin.

4. Van Hoosier Creek. T. 52 N., R. 2 E., Sec. 30. One trunk canker only of 1927 origin.

In addition to the pine infection centers seven infections on Ribes were located. Three from one to four miles below the Rock City pine infection, one on Short Creek four miles below the Van Hoosier Creek center, one on Bear Creek two miles from Enaville, Idaho, one along the Little North Fork of the

Coeur d'Alene River three-fourths of a mile above Horse Heaven Ranger Station, and one at the mouth of Canyon Creek one mile below Horse Heaven Ranger Station.

Middle Fork of the St. Maries River

1. Crystal Creek near Fernwood, Idaho. T. 44 N., R. 1 E., Sec. 29, 30,31. About 25 per cent of the very scattered trees along the stream are infected. There is an indication that this center originated in 1927 and was intensified by a light wave in 1930.

2. Olson Creek near Fernwood, Idaho. T. 43 N., R. 1 E., Sec. 16. Two trees with one canker each. Probably 1929 origin.

3. Along road two miles below Clarkia, Idaho toward Santa, Idaho. T. 43 N., R. 1 E., Sec. 36. Two cankers on one tree, probably 1927 origin.

Clearwater Timber Protective Association.

1. Elk Creek at Oxford Ranger Station. T. 38 N., R. 7 E., Sec. 31. Six cankers of 1927 and twelve of 1930 origin. Clumps of Ribes petiolare adjacent to this center have almost 100 per cent of the leaves infected with very heavy telial development.

ARE WE MAKING FULL USE OF OUR WESTERN ANNUAL CONFERENCE?

G. A. Root

I have taken the liberty, with due apology, to adopt the terse title of Putnam's article, "Are We Making Full Use of the Western News Letter" and apply it for a short comment on our Personnel Conferences.

The receipt of the proceedings of the last conference of blister rust workers in the East, together with reference to our own conference as expressed by MacLeod in his article, "Let Us Then Be Up and Doing"* has led me to say something of our western meetings.

These annual conferences have been taking place since 1923. This was before the entrance of many of our present personnel into blister rust work. In those earlier years there was a smoothness and clarity which was not manifested in our last meeting. This may be accounted for by the fact that the work had not struck the snags which it has today and there was less reason for debates and opinions. Furthermore, prepared written papers were then in vogue, which aside from short comments following their reading, did not require "fire works" in an attempt to arrive at some given policy.

Changing conditions and circumstances, the writer will admit, demanded a change of policy. In addition to prepared papers, more extensive discussions were necessary, but I am wondering if the pendulum has not swung too far the other way. We have lost the prepared papers (some of them well worth while) and have developed an extemporaneous quibble, with some

*This article is quite apropos, but its saving grace is due to the fact that it was written by a man with his coat off instead of by one with it on.

exceptions, which has evolved into a "dog eat dog" attitude and become too acrimonious for the general good health of the group. The type of meetings which we have fostered of late did reach the height of success in 1931 but in my opinion it fell down in 1932. Can we continue with this kind of conference or must we change our tactics again, at least for a time? It is no disgrace to have a meeting fall a little short of expectations or not be "the best and most constructive conference we ever had". Too often this statement becomes a mere platitude.

When I look at the eastern report for 1931, there is a polish and scope to it which is commendable. The papers are not exceedingly long and the comments or discussions following them are brief but to the point. It carries a wide range of subjects all more or less associated with the blister rust control program. One other good feature of the eastern conference is the presence of a number of so-called "outsiders" who lend a dignity and value to such a meeting. Could we enlarge a little on this and have a few more outside men?

The situation in the West may be entirely different from that in the East, so much so perhaps that our conference can't assume a similar form and accomplish the purpose for which intended. It may be well to continue to make our meetings practically a closed corporation. But even so, let us have a few prepared papers which may be utilized in forming a typed report of our meetings. Synopses are good but hardly fill the bill. Aside from our own satisfaction of having a safety deposit vault for some very good ideas, it would give the East and others interested an insight into what we have to contend with in the West and a larger perspective of the situation as a whole. The purpose of our annual meetings of late has been to allow a free discussion with the ultimate purpose of salvaging what appeared to be the best policy to pursue in the conduct of our work. A great deal of good has been derived--this policy should not be entirely discarded. Topics warranting free discussion should be conducted in committee meetings or smaller groups of those men most vitally interested. To some extent this has been done. Let less discussion take place in the regular sessions of the conference.

The foregoing remarks and comments in this article are entirely the opinion of the writer. They are offered for what they are worth as constructive criticism. There are probably weaknesses in some of the points raised. Comments by other coworkers are in order.

SOME RESULTS OF NEWMAN LAKE PLOT STUDIES

The maximum distance Ribes infection occurs from blister rust fruiting cankers increases enormously as the number of fruiting cankers in an infection center increases according to figures shown in the report by E. L. Joy of the studies conducted on the Newman Lake study area during 1929, 1930 and 1931.

The report states that the examination of the pines was completed in August, 1932 and that only one canker formed since 1928 was found on the

plot. This canker, of 1931 origin, produced aecia for the first time this year, is on 1931 growth and was reported in July.

From data taken in 1929, 1930 and 1931 there is an indication that this single 1931 origin canker (one year incubation) is the forerunner of a fairly large number from the same exposure that will be seen in 1933 (2-year incubation).

The following tabulation emphasizes this point by showing the increase in aecial and telial production and in spread distance from pines to Ribes from 1929 to 1931.

COMPARISON OF NUMBER OF AECIA-PRODUCING CANKERS, NUMBER OF INFECTED RIBES LACUSTRE, AMOUNT OF TELIA AND MAXIMUM SPREAD FROM PINES TO RIBES, IN 1929, 1930 AND 1931

Period Examined	Number of Fruiting Cankers	No. of Infected R. lacustre	Computed No. of Leaves 100% Infected with Telia	Maximum distance from Fruiting Cankers to Infected Ribes
June-Aug. 1929	18	6	0.02	165 feet
June-Aug. 1930	253	62	31.00	726 feet
August 1931	913	189	760.00	924 feet

Although the 1932 data have not been analyzed, it is apparent that the amount of aecia and telia produced this year was much greater than in 1931. Also infected Ribes were found at greater distances from aecia-producing cankers. If the predicted 1931 origin wave of cankers appears in 1933, we can expect a much greater wave in 1934 from exposure this year.

BURNT CABIN INFECTION CENTER BIGGER THAN EXPECTED

During September the blister rust infection center on the Little North Fork of the Coeur d'Alene River at the mouth of Burnt Cabin Creek, first reported by C. C. Strong, was scouted out and the limits of infection established.

Infection extends 60 chains up the river from the mouth of Burnt Cabin Creek, one mile down the river and about 35 chains up the creek itself. Cankers were found as far as three chains from the edge of stream type along the river but only in the stream type along Burnt Cabin Creek.

The heaviest infection is at the junction of the two streams with only scattered cankers over the remainder of the area. A large number of young white pines about 16 inches tall have been completely killed by the rust.

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NEWS LETTER

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U. S. Department of Agriculture
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Spokane, Washington

PREERADICATION SURVEY OF THE COEUR D'ALENE NATIONAL FOREST

C. C. Strong

When an emergency suddenly presents itself it becomes necessary to take immediate measures for accomplishing the desired end. Regardless of the nature of the emergency the agencies or persons affected are seldom prepared to act as effectively as would be the case had there been necessary time or incentive for preparation. The result is that a good many shots must be into the dark, so to speak. Inevitably, in most cases, mistakes are made which are excusable when the participants have acted upon the best information available. The case of the blister rust emergency in the West is no exception. The institution of control measures was handicapped by the inadequacy of fundamental information on which to base a program.

Ribes eradication, during the first five years, had for its primary objective the determination of the cost of treating areas to protect white pine from commercial damage by blister rust. With this information at hand it would be possible to balance the probable future value of a given stand of white pine against the combined probable cost of protecting and carrying that timber to maturity to show whether or not blister rust control was economically feasible and, if so, the lowest limit of white pine value which could be considered for protection. Owing to the time required for developing methods of treating R. inerme and R. petiolare masses which are so prevalent in the south half of the Inland Empire white pine belt, very little was known of the cost of applying these methods of treatment when the advent of blister rust made it necessary to undertake control work in that region.

The situation today is different. We now feel qualified to go into a region and estimate the cost of control with a high degree of accuracy. This statement assumes more dignity when one considers the accuracy of estimating the probable cost of first working on the portion of the St. Joe National Forest which was actually worked during the past season. The survey was made in the fall of 1931. The results show that the actual cost of the work was only slightly above that estimated. With one more year's experience to rely upon it is confidently expected that the estimate on the Coeur d'Alene Forest will prove as accurate as could reasonably be hoped for.

The survey on the Coeur d'Alene Forest had for its primary purposes the following:

1. To determine the white pine acreage, location of boundaries, quality and numerical abundance of white pines on the area covered.

2. To determine which of these areas had the requisite amount of white pine present to constitute white pine type of sufficient value to justify protection from blister rust and to map that white pine accordingly.

3. To determine the white pine type areas classed respectively as reproduction, pole and mature and to map those areas accordingly.

4. To determine and map the character of stream and upland types as it would affect location of control crews, administration of work and the cost of treating in protecting the areas against blister rust.

The survey was started on September 20 and completed October 27. The area covered totaled approximately 500,000 acres or about two-thirds of the Coeur d'Alene Forest. The Honeysuckle and Lakes ranger districts were excluded from the survey because information for those areas was secured in previous years.

Nine permanent employees of the Division, all of whom have had wide experience in Ribes eradication, made up the party.

The method of working was as follows:

The party leader, having access to whatever information regarding areas was available, substantiated by information secured from advance inspections, assigned each night a block for each man for the following day. These men that night mapped their respective areas on cross sectioned paper on as large a scale as would fit the sheet. Up-to-date topographic maps served as the basis from which field maps were made. In the field it was the duty of each man to so cover his block as to secure accurate information on each of the points enumerated above. No rules for covering blocks were prescribed, it being left to the judgment of the individual as to the manner in which he could most effectively work. Topography and ground cover were largely the determining factors.

Trails were very helpful in going to and from work but for covering a block had to be largely ignored, since accurate knowledge could be gained only from actually sampling all the varying conditions existing. Streams, ridges and points of known location such as section lines, peaks, lookouts, roads, trails, planting markers, etc., served as guides in determining the recorders' position at all times. While this method is not sufficiently accurate for some purposes it may be regarded as highly accurate for the purposes served by the preeradication survey.

One important by-product of the survey is the great number of reproduction counts made on white pine plantations. White pine was planted on about 12,000-14,000 acres in the Deep Creek drainage over the approximate period 1915 to the present. The counts will serve as a very good index to survival and will greatly substantiate checks of staked rows which are made periodically.

The cost of the survey has not yet been computed accurately. However, it will not exceed one-half cent per acre which compares favorably with such surveys in the past.

INFECTION CENTERS ON UPPER RUBY CREEK, 1932

H. G. Lachmund
Division of Forest Pathology

An infection center was found about two miles west of Niva Springs on the road from Elk River to Bovill. It extends from Ruby Creek for a short distance upon a draw drained by a small side stream which flows into Ruby Creek from the south. The pines are scattered and range mainly between 10 and 30 feet in height. On Ruby Creek they are associated with R. petiolare and in the draw with R. lacustre. The year of original entry of the disease at this center was not determined. Judging from the heavy intensification which occurred in 1927 and 1928 it probably dates back to about 1923 as at most of the other Idaho infection centers. Intensification in 1929 and 1930 was relatively light. The following is an indiscriminate sample tabulation from the cankers at the area. Needle retention on the pine ranged from 3.5* to over 5 years.

SAMPLE TABULATION OF CANKERS, UPPER RUBY CREEK INFECTION CENTER TWO MILES BELOW NIVA SPRINGS, IDAHO, OCTOBER 9, 1932

Year of Growth Infected	Number of Cankers									
	First Symptom		Juvenile		Fresh Pycnia		Pycnial Scars	Produced Aecia		
	Spot	Other	Early	Late	Early	Late		Once	Twice	Several
1932										
1931										
1930										
1929		1		1		1				
1928		1	2			1	3	2		
1927			2		2		11	15	2	1
1926							5	12	14	7
1925							2	2	5	2
1924									1	
1923										

From 10 trees - 5 to 15 cankers taken per tree depending on assessibility and absence of any doubt as to age of growth and stage of development.

* Season's defoliation completed - all of 1932, 1931 and 1930 needles present - 50 per cent of 1929 needles still persistent.

The segregation and grouping of the cankers of the 1927 and 1928 waves in alignment with the typical distribution pattern of cankers of given years of infection on P. monticola is striking.

Another and newer local focus of infection was found in a patch of small reproduction ranging to about 8 feet in height on the south side of the road at the first crossing of Ruby Creek below Niva Springs and about a quarter of a mile above the older center. The following is a sample tabulation of cankers at the focus. Needle retention ranged

mainly from 3 to 5.7 years on the pines here. The pines were in close proximity to R. petiolare along the stream.

SAMPLE TABULATION OF CANKERS - UPPER RUBY CREEK INFECTION CENTER AT FIRST CROSSING OF RUBY CREEK BELOW NIVA SPRINGS ON ELK RIVER-BOVILL ROAD, OCTOBER 8, 1932

Year of Growth Infected	Number of Cankers									
	1st Symptom		Juvenile		Fresh Pycnia		Pycnial	Produced Aecia		
	Spot	Other	Early	Late	Early	Late	Scars	Once	Twice	Several
1932										
1931										
1930			1	1	1					
1929	5	5	2	1	5	5	1			
1928	2	2	8	5	9	8	4			
1927	2	1	2		1	2		1	1	
1926						1			1	1
1925										
1924										
1923										

From 11 trees.

From the above tabulation it is seen that a relatively small amount of infection occurred here about 1927 and 1928 and the arrangement of the younger cankers indicates that the heavy intensification occurred primarily in 1929 with a smaller amount in 1930. The relative extent of the 1930 infection, however, cannot be judged until next year when the remainder of the 1930 cankers make their appearance.

About 50 cankers were marked at this focus for growth measurements. These may help to explain the evidently long incubation period and slow development of the cankers here as well as at the older center farther down the road.

COMMENTS ON THE CALIFORNIA BLISTER RUST SITUATION

L. N. Goodding

Mr. Detwiler's article, The Western Front, in the October Blister Rust News is at hand. If any man's prediction regarding the spread of blister rust should carry weight it should be Detwiler's. He has observed the disease under all sorts of conditions and he reasons from two premises, i.e., the extreme susceptibility of sugar pine and the heavy infections in central Oregon, that blister rust must soon be in California.

Root and I did not find blister rust in California. The present article is not, however, an attempt to vindicate us. We merely scouted for blister rust and failed to find it. If there are those who still feel that we merely failed and that blister rust is in California, they should not be denied the privilege of beliving as they please.

I do not believe blister rust is in California at present or that it will be in the Sierras in that state for several, possibly many, years. That it will move into the Siskiyous of northwestern California within a comparatively short time seems extremely likely. May be it will be picked up in the Crescent City region next year.

No hunch, divine revelation, or other message from the Cosmic tells me that blister rust is in California. A lot of country, not at all favorable for the establishment or spread of the rust, combined with a great distance to known centers of infection make me doubt that it is in the Sierras or that it will be there soon. Very careful scouting in favorable situations of thousands of stink currants in northwestern California convinced me that it had not gotten that far south along the coast route.

I wish that those who are interested would study a map with me. Before we start let me say that too little scouting has been done in Oregon the last two seasons to entirely justify some of the statements I am about to make. Even the little work done this last summer was on time "stolen" from the California job. The farthest point south where pine infection has been found is at Minto Creek west of Mount Jefferson one-fourth of the distance across the state from the Columbia River. Two significant currant infections were found south of this point, one at Lost Creek, on the McKenzie and one below Oak Ridge on the Willamette River. The last named place is half way across the state. If there were pine infections in the Oak Ridge region old enough to produce aecia we could confidently expect to find infected currants about Waldo Lake, Odell Lake and Crescent Lake. No scouting was done in these sections in 1932, but pretty careful work was done during the summer and fall of 1931. Scouting was also done on the headwaters of the Umpqua and the Rogue. Blister rust travels long distances, but to conclude that it could travel this route and leave no tracks does not fit in with the picture I have painted for myself. To reach the Sierras it not only must pass over an arid region, but it must land in a region far drier than any in which I have ever seen blister rust gain a foothold. Deserts in themselves are not barriers but for the rust to get up and jump over a hundred miles or more of favorable territory, cross another hundred of desert and land on Ribes roezli north or south of Mount Shasta where streams are almost as rare as millionaires in the Blister Rust Division just doesn't seem reasonable to me.

Blister rust has swept down the Willamette Valey this season and has shown up as never before. This may be due to a greater volume of aeciospores in some of the known pine infection centers or to new pine infection centers. More likely, however, it was due to the excellent early summer weather with rains and heavy dews. Rust this year was found on the Oregon State College farm east of Corvallis on three species of Ribes, near Wren on Ribes sanguineum. This location was made by Mr. Vincent, who has worked a couple of seasons on eradication in Idaho. It was also found on the game farm north of Corvallis on R. sanguineum by Steve Coleman. The

important thing is that these indicate how the rust has traveled along the valley. Conceivably, it could spread to the south long distances by this route. The passes to the south, such as the Cottage Grove region, and the Canyonville region, however, showed no indications of rust.

That the rust has spread along the coast range is evident. Doubtless it is well established on pines at some point in Washington, Yamhill, Tillamook, or Polk counties and may be in several places which we have not discovered. We know about the Mount Hebo infection. Strange as it may seem, blister rust was not nearly so abundant on Ribes in the Hebo region this season as it was last year, and along Three Rivers late in October I was unable to find rust even at places where it was abundant last year. In poor keeping with this, however, was the fact that a heavy concentration of it was found seven miles north of Marshfield. It was also found at two points on the Alsea. White pines (<u>Pinus strobus</u>) and stink currant southeast of Marshfield at Sumner showed no indication of the disease. No rust appeared on Brush Creek or Mussel Creek in Curry County at which points it was found in 1929 and at one of which, i.e., Brush Creek, again in 1931. There are pines a few miles back from the coast in Coos and Curry counties. Had rust become established on these in 1929 or earlier it is almost certain Root and I could have picked it up at Brush Creek and other points to the south including the Crescent City region.

There are some hopeful signs that blister rust will have hard sledding in California; first, the dryness of the site as a whole, second, the fact that blister rust has stayed "put" so long in the Minto Creek region possibly indicating an approach to its climatological limit, and third, the heavy parasitism in the Rhododendron region and in the Hebo region. Among the disconcerting things are the extreme susceptibility of sugar pine, the high susceptibility of the Sierra Ribes, especially <u>Ribes roezli</u>, and <u>R. cruentum</u>, the wide distribution of <u>Cronartium occidentale</u> which so closely resembles blister rust and the fact that the coast gate seems wide open into the Siskiyou region where blister rust may be expected to become established and where there are many places favorable for its intensification.

<u>SCOUTING FAILS TO REVEAL BLISTER RUST IN CALIFORNIA</u>

G. A. Root

Contrary to what some members of the personnel may think regarding the presence of the rust in California, a concerted scouting program failed to reveal any sign of the disease. There was reason to believe the rust might be found in the northwestern section of the state, due to its presence in Curry County, Oregon, of several years past. However, the rust was not found at the two original locations of 1929 in Curry County nor elsewhere in this general vicinity. Goodding did find it near Marshfield in Coos County.

In the Sierra Nevada region, scouting took place as far south as Strawberry in the Stanislaus National Forest. It was difficult to know just where to make inspections over this extensive area without the good lead

which is present in the coast region. It was logical to "hit" the old <u>C. occidentale</u> locations. Some of these are in good sugar pine areas. Who can tell but what <u>C. ribicola</u> might lurk some day at some of these points or that what we call <u>C. occidentale</u> may prove to be white pine blister rust.

Think what we may, California must pass into the category of non-infected states for another year.

THE EFFECTIVENESS OF CONTROL

S. N. Wyckoff

The tabulations in this article were prepared at my request by Joy, to ascertain if our field data contained real information regarding the effectiveness of our control operations. The results were so striking that they seem worthy of general attention within our organization.

The areas listed in these tabulations cannot be regarded as "hand picked". Five areas similar to those in the first tabulation and in this general vicinity have been studied. The two not listed here show results exactly comparable to the three included. The three areas listed in the second tabulation are the only ones of this type which have been studied in the Clearwater Forest area.

A number of years ago when Ribes eradication was first advocated in the Eastern states as a method of controlling blister rust, considerable doubt existed in the minds of many people that this method would be successful. This question, has of course, been settled for the Northeastern states. Proof was thereby given that if a thorough job of Ribes eradication could be done, pine could be protected. When control methods were being developed in the West, the same question arose in the minds of many people. The method was known to be sound but doubt existed as to whether or not, under western forest conditions, Ribes could be eradicated to such a point as to protect pine. Further study of our western situation showed us that a large proportion of the Ribes infecting power lay in the stream type. The result was that stream type Ribes eradication was advocated as the first and most immediately necessary step in a general control program. We now have some concrete figures to show us what we are accomplishing by stream type Ribes eradication.

The greatest danger in these figures probably lies in the fact that they may cause an undue degree of optimism. We must remember that the Ribes listed in this first tabulation as having been eradicated are undoubtedly those directly responsible for the pine infection. We must further remember that the upland types contain many more Ribes which in turn will spread infection unless they are removed. These figures undoubtedly show us that a good job of stream type Ribes eradication will in many places give us more time in which to complete the entire job than we would otherwise have had. They do not mean, however, any more than that we are making a good start on a long and difficult assignment.

STATUS OF RIBES ABUNDANCE AND PINE INFECTION ON THREE AREAS ON WHICH INITIAL RIBES ERADICATION WAS PERFORMED IN 1929, CLEARWATER FOREST AREA IDAHO, 1932

Area	Years of Ribes Eradication	Ribes Ft. Live Stem Per Acre: Before Initial Erad.	Ribes Ft. Live Stem Per Acre: After Erad.	Year Infection Studied	Number of Infected Trees Studied	Number of Cankers Found	Per Cent of Cankers Formed: 1929 or Before	Per Cent of Cankers Formed: Since 1929
Deer Creek near C.T.P.A., Headquarters, Ida., T. 38 N.,	1929	31,242		1931	168	313	100.0	0.0
R. 5 E., S. 23,26	1931		87	1932	69	101	100.0	0.0
North Fork of Reed's Creek, 3/4 mi. below Headquarters	1929	28,810						
Ida., T. 38 N.,	1931			1930	7	*34	100.0	0.0
R. 5 E., S. 15	1932		9	1932	6	15	100.0	0.0
Alder Creek 3/4 mi. below mouth of Loop	1929	11,524						
Creek, T. 38 N.	1931							
R. 5 E., S. 8,9	1932		63	1932	9	88	100.0	0.0

STATUS OF RIBES ABUNDANCE AND PINE INFECTION ON THREE AREAS ON WHICH INITIAL RIBES ERADICATION WAS NOT PERFORMED IN 1929, CLEARWATER FOREST AREA, IDAHO, 1932

Area	Years of Ribes Eradication	Ribes Ft. Live Stem Per Acre: Before Initial Erad.	Ribes Ft. Live Stem Per Acre: After Erad.	Year Infection Studied	Number of Infected Trees Studied	Number of Cankers Found	Per Cent of Cankers Formed: 1929 or Before	Per Cent of Cankers Formed: Since 1929
North Fork of the Clearwater River near Quartz Creek T. 40 N., R. 8E. S. 22	1932	(Est.) 2,000	69	1932	23	504	18.2	81.8
Hemlock Creek near Weitas Ranger Station T. 37 N., R. 8 E., S. 9, 16	1932	(Est.) 5,000	61	1932	19	360	3.1	96.9
Elk Creek just above Oxford Ranger Station T. 38 N., R. 7 E., S. 31	1932	(Est.) 5,000	No Erad.	1932	4	18	33.3	66.7

*These cankers were destroyed.

H I file.

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

IMPRESSIONS FROM THE EXAMINATION OF IDAHO PINE INFECTION AREAS, 1932

H. G. Lachmund
Division of Forest Pathology

1. There has been a striking reduction in the intensification of the disease on pines following eradication of R. petiolare along the streams. At most areas where intensification was progressing rapidly prior to the eradication of the R. petiolare concentrations, hardly any cankers of a year of origin post-dating the eradication year can be found. While the scattered R. petiolare left along the streams and the upland Ribes associated with the pines may be expected to cause trouble in a favorable infection year, and will have to be taken out, the evidence of the effectiveness of stream type eradication in halting these incipient epidemic outbreaks of the disease is highly encouraging.

2. Climatic conditions are generally less favorable for the rust in Idaho than west of the Cascade Mountains and in British Columbia.

3. The development of the fungus on pines is slower in Idaho than in the other sections of the rust's range. This appears to be caused by a generally colder climate and shorter growing season in Idaho.

4. The great majority of the cankers produce pycnia two and frequently three successive years before producing aecia. Aecial production is therefore generally a year later following the appearance of the cankers than west of the Cascades and in British Columbia. It is also much lighter than in these sections with the possible exception of the Olympic Peninsula.

5. The slower development of the rust tends to extend the incubation period of the disease on pines in Idaho. In some cases most of the cankers of a given infection year may not make their appearance until the third year following the infection year. This appears to occur primarily only when the infection takes place late in the season and local growing conditions are particularly unfavorable for the rust on pines. However, extensive production of cankers in the third season is a regular occurrence at Idaho infection areas.

6. The characteristic distribution pattern of cankers of a given year of origin will apply in general in infection year determinations for Idaho pine infection areas, and methods can be worked out to take care of exceptions.

7. The present year has been a poor one for the intensification of the rust on Ribes in northern Idaho as measured by British Columbia standards.

BLISTER RUST DEMONSTRATION AT WENATCHEE, WASHINGTON

R. L. MacLeod

A blister rust demonstration was placed in the Horticultural Show held in Wenatchee, Washington from November 30 to December 2, 1932 in conjunction with the annual meeting of the Washington Horticultural Association. Approximately five hundred members of the association attended this meeting.

The blister rust demonstration consisted of a series of panels showing the life cycle of blister rust, photographs of western white and sugar pine, damage pictures, specimens of the disease on pine and Ribes and photographs of protection work. A series of 50 lantern slides was shown with the baloptican and attracted a good deal of interest. Two hundred copies of Miscellaneous Publication No. 23 were distributed.

In a blister rust demonstration of this nature the essential thing is to show simply and clearly the weak points in the life cycle of blister rust, that is, the fact that the disease cannot spread directly from pine to pine but must go through a stage of development on the alternate host and that on account of the short distance spread from Ribes to pine the pine can be protected. Our demonstration material shows these facts but does not emphasize them sufficiently. Photographs showing the values at stake, damage and protection work and the display of specimens should be contributory to the ideas expressed in showing the life cycle of the disease.

FURTHER COMMENTS ON THE CALIFORNIA BLISTER RUST SITUATION

G. A. Root

Modesty forbade me to express my views concerning the blister rust situation following last season's scouting program. Furthermore, as a Californian, it has been the better part of discretion to keep silent. Now that the ice is broken by one from outside the state, whose views ordinarily are not particularly conservative, comment may be made by the writer without equivocation or mental reservation.

Before plunging into the subject I wish to place a big O.K. on most of Goodding's deductions. I am a bit surprised he deviated as far as he did from the conceptions held generally by most of the blister rust men.

Scouting is one type of work the success of which is measured by results found--the discovery of the rust. In failing to find such, a stigma of inefficiency or inability is inclined to be attached to such work. The careful close work which should, and invariably does, accompany such a task is often overlooked or possibly I should say not appreciated. Were that which is sought for and desired and not found in other fields of endeavor looked upon as scouting generally is, there would be failures galore--fortunately for the general welfare of a program, they are not.

If the rust is in California and there are grounds for believing such is the case in the northwestern part of the state, it is not in sufficient quantity or widespread enough so as to be picked up by the ordinary means of scouting. The statement has been made that scouting means little with the small force generally employed--that it would take an army to make it worth while. I can hardly agree with this statement for it has been found without an army in other states and will be found in California without an army when the propitious time arrives.

It is needless to repeat or greatly enlarge upon the deductions so aptly arrived at by Goodding. I have more faith in the "dryness of the site as a whole" and the question of "climatological limit" than in the parasitical aspect.

The greater susceptibility of sugar pine over western white pine has apparently been determined, but not within its true range or habitat. The significance of greater susceptibility cannot be ignored but what economic importance this will have is still to be determined. The general aridity of the sugar pine range and attendant factors which may cause a lessening of the viability of sporidia and consequent degree of infection (touched upon by Putnam in the March issue, 1932) may more than offset the susceptibility factor.

Pinyon blister rust has been mentioned in connection with the California situation. It occurs in the driest sites and the mass of telia produced is phenomenal, yet the nearby pinyons are not so badly shot as one would imagine. Something is preventing wholesale slaughter of this species in many areas.

Some may say that all these points raised with reference to California are mere speculations. They probably are, but conditions are such that it is not strange they have been propounded.

Blister rust may not make such inroads into the sugar pine belt as is generally believed. This thought can be borne in mind with a certain degree of satisfaction. It is not beyond the pale of possibility that control measures can be changed to take care of the California situation. A let-up in the spread or intensity which may occur in a region or state should not be looked upon with fear that the whole control program will be jeopardized. There will be enough territory where the orthodox methods of control work can be applied to good advantage.

BLISTER RUST IN MOUNT RAINIER NATIONAL PARK

M. C. Riley

Ribes infection was first found in Mount Rainier National Park during the course of a general pathological reconnaissance conducted by the Division of Forest Pathology in the fall of 1928. In 1930 infection was found on white pine on Emerald Ridge, Fish Creek and at Longmire, and in 1931 on the Muddy Fork of the Cowlitz. All of these infections are within one mile of heavy R. bracteosum concentrations.

The Emerald Ridge infection consisted of a total of four cankers which were removed as soon as found. The Longmire infection extended in a narrow belt not over one-fourth mile along the river where in 1930 ten infected trees having 68 cankers were found out of 47 trees examined. Inspection of 37 trees in 1931 revealed 11 trees infected with 64 cankers, and in 1932 four more trees were found to be infected with 7 cankers. All cankers found have been removed. On the Fish Creek area the infection covers approximately 1,000 acres. Practically every pine in the area is infected, the degree varying

from trees with only a few young cankers to those which have been killed by the disease. It is estimated that many trees have over a thousand cankers each.

On the Muddy Fork of the Cowlitz the infection is generally distributed over approximately 1,700 acres but in this area there are patches of nearly 50 acres where no infected trees have been found. A survey was conducted on the area during the past field season to locate the infection centers with the idea that the location and extent of these centers might have a bearing upon the Ribes eradication work which was in progress at the time but which could not be completed during that field season.

Strips one rod wide and 10 chains apart were run at right angles to the course of the streams and all white pine trees were examined on these strips. It was realized that an infection center might be missed by this system but it was felt that sufficient leads could be obtained so that centers could be located more easily than by a random system of scouting. Of the two infection centers found, one was a direct result of the strip system and the other was located by means of leads secured while running strips.

A canker analysis was made of infected trees in each center. A sample tree from one of these infection centers shows a total of 43 cankers 12% of which were first symptoms, 5% juvenile, 25% had produced pycnia once, 33% had fruited once and 25% had fruited several times. This tree was 25 years old, 25 feet high with a D. B. H. of 6 inches and there were approximately 721 feet of needle bearing stem. 1924 wood was the oldest showing infection and there were no cankers over 6 feet above the ground. Previous to Ribes eradication work in 1932 there had been a heavy concentration of R. bracteosum around the infection center.

No trees have been found on the area which have been killed by blister rust but a good many "flags" are in evidence. It is safe to say that there will be more severe damage within the next few years because many isolated trees were found which were more heavily infected than those in the infection centers. One of these was a tree five feet high which had 57 cankers, none of which had reached the fruiting stage.

It is not expected that there will be very heavy damage from the 1932 crop of aeciospores because, due to heavy snow and a late spring, a large percentage of the R. bracteosum bushes were still under snow or at least had not produced leaves, until after the aecia had been disseminated. This caused a very noticeable decrease in the amount of Ribes infection over that observed in 1931 on all of the infected areas.

Since the cutting of cankers on infected trees has its place in the scheme of protecting stands of white pine which are primarily of aesthetic value, a small number of studies were started on both limb and trunk cankers in an attempt to determine the distance between the outer edge of the mycelium and the outer edge of the discoloration. In the case of limb cankers, the limbs were cut off at varying distances from the edge of the discoloration toward the trunk of the tree and in the case of trunk cankers, the cambium layer was removed for varying distances. It is hoped that next summer some definite information may be obtained.

TREATMENT OF RIBES INERME STREAM TYPE WITH HEAVY TRACTOR EQUIPMENT
HONEYSUCKLE RANGER STATION

John F. Breakey

Some interesting information was secured from the brush removal by tractor at Honeysuckle Ranger Station, Coeur d'Alene National Forest, which was begun on October 26 and discontinued on account of rain and snow November 17, 1932. In the earlier operation at Clarkia emphasis was placed on constructing piles where it was most convenient for the brush removal operation. The result was that unexpected difficulty in burning was met with due to the fact that many piles were located in low swampy places or too near streams with little readily combustible fuel under the pile. On the Honeysuckle operation emphasis was placed on the future burning chance. This was accomplished by locating piling spots ahead of the actual brush removal and constructing fuel beds consisting of brush, logs and other debris upon which the machine was to push material removed from the balance of the area. The writer proved to his own satisfaction that this could be done without any appreciable additional expense over the method followed at Clarkia. Adjoining timber and hillside slopes are left entirely free of danger from fire when brush piles are later burned. Stream type and swampy areas can be freed of brush and the same piled on higher ground if the beaver dams are first removed.

Although the final figures have not yet been determined, present indications are that the cost of 100 per cent removal of brush from the area by the tractor method will be about $50 per acre.

Of the area upon which work was done, ten acres were completed and left ready for burning next summer. The preliminary work of slashing the brush and piling it on the areas where windrows are to be made with the tractor was completed on an additional 12 acres. The per acre cost figures quoted above does not include the cost of burning. Undoubtedly the clearing cost will prove smaller in the future when possible short cuts are put into effect and better weather conditions prevail.

The steps in conducting this operation in order of execution were as follows: (1) Survey of ground, determining locations of trees to come down, trees to be left standing, relative location of brush piles, the location of insurmountable obstacles which must be removed with powder or saw, and streams including beaver dams. (2) Removal of beaver dams and surplus water by use of stumping powder. (3) Slashing and piling of brush into windrows on area where brush piles were constructed with tractor. (4) Felling, bucking and piling of snags and trees (those designated for removal onto the brush windrows.) (5) Cutting of projecting branches on windrows so that brush was in compact piles. (6) Bucking of down logs so that a minimum of tractor time was required in their removal. (7) Blowing of stumps which would interfere with tractor operation. (8) Piling of down logs ahead of tractor operation whenever feasible. A team was used to good advantage. (9) Actual removal of

brush from area and piling on previously constructed brush windrows by means of the tractor equipped with bulldozer attachment. (10) Cutting of brush projecting from completed windrows to make the piles more compact.

The purpose in preliminary windrow construction was to provide air space and fuel under the finished windrows to insure complete burning of the piled material. Otherwise it was feared that the amount of dirt shoved up with the tractor might make complete burning of the piles impossible. Four swampers were used in preliminary work.

Ten acres of brush were piled with the tractor in 58 hours' running time. The average tractor running time per acre is 5.8 hours.

During the time the work was being done at Honeysuckle the weather was very disagreeable. Fifteen inches of moisture fell between October 1 and November 17, 1932. From November 12 to November 17 six inches of moisture were recorded.

The following observations were made during three weeks of close study of the machine and its work. Wide swamp tracks instead of standard tracks with which the machine is equipped are needed for this type of work. The two-way hoist is needed. The digging teeth should be set on an open frame in order that the dirt may filter through them. Some motor driven mechanical shaker should be provided to keep the wet earth sticking to the brush roots from packing between the teeth. The machine should have a cage or roof made to shield the operator from falling snags and brush. Exposed oil pipes, governors, etc., should be supplied with special shields.

SUMMARY OF BLISTER RUST CONTROL OPERATIONS IN IDAHO, 1932

1. Initial Working

Forest Unit	Stream Type		Upland Types			Total	
	Acreage Worked	Cost Per Acre	Acreage Worked	Ribes Per Acre	Cost Per Acre	Acreage Worked	Cost Per Acre
Clearwater N.F.	3,845	$5.47	52,310	160	$2.23	56,155	$2.45
St. Joe N.F.	2,799	10.24	27,127	180	2.85	29,926	3.54
Total N.F.	6,644	7.48	79,437	167	$2.44	86,081	$2.83
Clearwater T.P.A.	655	6.95	11,040	96	1.85	11,695	2.14
Clarkia	431	4.98	1,139	31	1.28	1,570	2.29
Priest Lake	1,228	2.39	16,138	54	1.32	17,366	1.40
Total State and Private	2,314	4.16	28,317	69	1.52	30,631	1.73
Grand Total	8,958	6.62	107,754	144	$2.20	116,712	$2.54

2. Second Working of Stream Type

Forest Unit	Acreage Worked	Cost Per Acre
Clearwater N.F.	2,740	$2.71
Clearwater T.P.A.	1,505	3.34
Total	4,245	$2.93

KILLING RIBES PETIOLARE IN BEAVER DAMS

B. A. Anderson

The technique of applying sodium chlorate to Ribes petiolare has been developed to such an extent that it is now possible to secure a 100% kill of this species on almost any site except one. Where the roots of R. petiolare are wholly or partially submerged in water the kill is patchy, especially so if the plant has developed large masses of water roots. The heavy concentrations growing in beaver dams have been exceedingly difficult to deal with. In such a site it is not uncommon to see 75% of the Ribes live stem submerged. Naturally when but 25% of the live stem of the plants are soaked with the chlorate spray a low efficiency is the result. The tops kill to the water's edge and are succeeded by a new crop of shoots within a few weeks.

During the past summer a number of experiments were run to determine if draining the dams before spraying the Ribes would result in a better kill. A series of beaver ponds were selected and the dams blown out with dynamite. Each pond was allowed to drain for approximately twenty-four hours. Contrary to the widespread belief that if a dam is blown out with dynamite the beaver will not rebuild, we found them hauling in debris as soon as the men left the vicinity. It was necessary to put on a night patrol to keep the dams open and undisturbed.

One of the ponds was kept open for two weeks, another one week, a third for three days, after spraying the Ribes with a 10% solution of sodium chlorate. It was possible to lower the water in all of the ponds from about eight inches at the upper end to approximately 18 inches at the dam. Lowering the water level this amount made it possible to thoroughly drench almost 100% of the live stem and a large proportion of the water roots which were present.

After each of the ponds had been held open the requisite number of days the dams were then carefully rebuilt so as to bring the water level to exactly the same height as before draining.

Two control plots were used. On the first the Ribes were sprayed without lowering the water level; on the second plot the dam was blown out and the Ribes left without spraying.

During the draining of the ponds a curious phenomenon of the relation of water roots to the plant was noticed. As soon as the water had been lowered the foliage of the R. petiolare bushes possessing large mats of water roots immediately began to wilt and dry up. At the end of the second day the leaves were so dried that it was almost possible to crinkle them between the fingers. Then the bush gradually recovered and with the exception of the loss of a few leaves returned to its former luxuriance. Bushes possessing few, if any, water roots were not affected by the draining to any appreciable extent.

The plots were sprayed during the period July 28 to August 2 and were inspected at regular intervals afterward until September 15. At that time R. petiolare in the undrained control plot showed considerable resprouting in sufficient amount to reestablish itself within two or three years. But the bright side of the picture is that R. petiolare on every plot that had been drained before spraying showed absolutely no signs of resprouting. When the length of time to keep open each of the various beaver dams was discussed three days was decided upon as the minimum. In view of the apparently excellent results obtained on the three-day plots it is regretted that a two or three-hour plot was not included. It is not necessary to respray R. petiolare on drier sites to secure a 100% kill if the brush has been sprayed approximately one hour prior to a rain. Perhaps the reaction of the submerged parts of a Ribes bush to the chemical is similar.

The various plots will be rechecked at the end of the 1933 field season to secure final results. If draining the dams before spraying insures a 100% kill on R. petiolare it will be the first method that we have found to successfully treat this species on flooded sites.

HOLIDAY GREETINGS

With the passing of the year 1932 an unusually eventful period is committed to the pages of history. In its passing let us not forget that it has been a year trying to the soul of men throughout the world. Ours is a public service. This holiday season should, more than ever before, offer to the public servant a golden opportunity to recommitt his efforts to the good of this commonwealth to the end that the new year shall bring renewed confidence and better times to the multitude of sufferers throughout our nation. Let this spirit permeate our holiday atmosphere. The News Letter conveys to all its readers greetings of the season and a message of cheer for the future.

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